MONTHLY WEATHER REVIEW.

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VOL. XXXIV. OCTOBER, 1906. No. 10

The MONTHLY WEATHER REVIEW is based on data from about 3500 land stations and many ocean reports from vessels taking the international simultaneous observation at Greenwich noon.

Special acknowledgment is made of the data furnished by the kindness of cooperative observers, and by Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt I. S. Kimball, General Superintendent of the United States Life-Saving Service; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; Señor Anastasio Alfaro, Director of the National Observatory, San José, Costa Rica; Rev. L. Gangoiti, Director of the Meteorological Observatory of Belen College, Havana, Cuba.

As far as practicable the time of the seventy-fifth meridian, which is exactly five hours behind Greenwich time, is used in the text of the MONTHLY WEATHER REVIEW.

Barometric pressures, both at land stations and on ocean vessels, whether station pressures or sea-level pressures, are reduced, or assumed to be reduced, to standard gravity, as well as corrected for all instrumental peculiarities, so that they express pressure in the standard international system of measures, namely, by the height of an equivalent column of mercury at 32° Fahrenheit, under the standard force, i. e., apparent gravity at sea level and latitude 45°.

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

SUGGESTIONS AS TO TEACHING THE SCIENCE OF THE WEATHER.

Outline of lecture by J. WARREN SMITH, at Teachers' Institutes in Ohio, August, 1906.

Practically all life and energy with which we are familiar comes from the sun. The sun undoubtedly controls all our weather conditions. There is no well established relation between the sun spots and the weather, notwithstanding recent newspaper writers to the contrary, but it is probable that there is a relation between the variations in the activity of the sun and the weather of our globe—not directly in well established lines, but indirectly thru a long chain of conditions that will produce different results in different places.

The moon causes a tide in large bodies of water, but its influence on our atmosphere produces a tide of only 0.004 inch on the mercurial barometric scale, and it has no recognizable influence upon the weather conditions.

The planets do not have the slightest influence on the weather, and people who pretend to predict the weather for weeks or months in advance by basing their calculations on the positions of the planets are deceiving themselves or are intentionally misleading the public.

The officials of the Weather Bureau believe that the time will come when we shall be able to predict the general character of the weather of a season, and possibly of a month, for several months in advance; but no reliable meteorologist believes for a moment that we shall be able to predict, several weeks or months in advance, the character of any day or the movement of any particular area of storm or fair weather across the country.

Very careful computations give the temperature of the surface of the sun at between 5000° and 10,000° F. This temperature denotes the energy of molecular motions that we call heat, and these motions, whether undulations or vibrations, move outward from the sun thru the ether of space with great rapidity and in every direction. The earth in its revolution about the sun intercepts less than one two-billionth of the energy of the solar radiation.

An iron ball attached to a chain so that it may be heated red hot and held up in the school room offers a most excellent example for illustrating and explaining solar radiation, as well as all the different radiation and absorption phenomena. A spectroscope or simple glass prism should be in constant use also. No scholar is too young to admire the rainbow and the other beautiful atmospheric colors, and to wonder how they are produced. Therefore no scholar is too young to have the colors of the spectrum shown him, and to have the principles of refraction, reflection, and diffraction illustrated and explained.

A scholar may not understand that the different wave lengths of solar energy make the colors of the spectrum possible, but it opens up wonderful fields of possible educational attainment to him when you explain that beyond the violet there are the unseen photographic or chemical rays, and beyond the red rays there are the unseen heat and electric waves. It may not mean much to some scholars to tell them that Schumann's shortest ultra-violet waves are something less than four millionths of an inch in length, or that Langley has measured the infra-red rays 529 millionths of an inch in length and Rubens and Nichols 944 millionths of an inch in length; but if you can get the scholar to inquire how these measurements are possible you have accomplished very much.

More recent investigations in connection with electric waves indicate that these may be several inches or several yards or even several hundreds of yards in length. They can be reflected, refracted, and polarized just as light waves; but altho these waves have many analogous properties, yet they have also fundamental differences.

Heat is transmitted by conduction, radiation, reflection, and convection. The principle of conduction is easily shown, as well as the difference between a good and a poor conductor. Radiation can quickly be explained by the example of the hot stove and the person of the scholar, or the red-hot ball and a thermometer. The fact that radiated heat does not necessarily heat the air thru which it is transmitted can be shown by holding one thermometer directly exposed to radiation from the hot ball and another thermometer behind a card even nearer the ball than the first thermometer. This experiment is desirable to enable the student to understand that the air is not warmed to any considerable extent by the direct heat of the sun.

Reflection of heat can be shown with the hot ball and a looking-glass; convection, by putting some sawdust into water and holding the dish over a burner, or by holding light tissue paper in the current of air rising from a hot stove.

With the hot ball and a square hole in a piece of cardboard, or by a simple geometrical drawing, you can quickly show that more heat can reach a given surface of the earth if that surface lies horizontal to the rays of the sun than if it is slanting. With the drawing you can show also that the sun's rays in passing thru the atmosphere have a less distance to go if they are vertical than if slanting.

Of the solar heat that strikes the atmosphere about 75 per cent gets down to the surface of the earth when the rays are vertical, 64 per cent with the rays at an angle of 50°, and 16 per cent with the rays at an angle of 10°. The rest is interrupted, chiefly by the moisture and dust in the atmosphere; so that while clean, pure, dry air is not sensibly warmed by direct solar radiation, yet the dust and moisture in the atmosphere does absorb some of that radiation.

The relative energy of the solar radiation that reaches the earth under vertical and slanting rays has been represented by one writer by the work of horses so standing that the shadow of any horse shall not fall beneath any other horse. Under vertical rays the horses can stand close together, while under very slanting rays they must be yards or rods apart.

Some dark bodies absorb radiant heat more rapidly than some light ones. To demonstrate this put a black leather and a light-colored leather cushion in the sun and place the hand on them after a little. Or coat the bulb of one thermometer with lampblack and paint the bulb of the other white and expose them to the radiant heat of the sun or of the red-hot ball.

All cooking utensils should be black and have a rough surface where exposed to the fire. I waited two solid hours for my dinner one day because an inexperienced cook tried to boil corn in a new tin pail. Light-colored clothing should be worn in the summer. The earliest ripened grapes are those hanging against a rough, dark wall.

When the heat rays strike the surface of the earth they raise the temperature of the surface of the land fully four times as fast as they raise the temperature of the surface of the water. Very little heat is reflected from the surface of the land, while a considerable percentage is reflected from the surface of the water. Heat is transmitted by conduction very slowly in the soil. The daily change in temperature is not felt deeper than about three feet in the land, but from 30 to 60 feet in the water. The annual changes in temperature are not appreciable below 65 feet in the land, but are felt from 300 to 600 feet deep in the water. At twenty feet below the surface of the land the maximum temperature occurs in December and the minimum near June. Part of the solar heat becomes latent in the act of evaporating a slight amount of moisture from the surface of the water, and part penetrates a considerable distance. And not only this, but when any part of a water surface is heated it may be replaced by convection by colder water. This can be splendidly shown by hanging the red-hot ball over one end of a tank of water in which litmus paper has been suspended.

Fresh water is densest at 39°. This explains why ice floats and why fresh water ponds do not freeze solid. By putting water at a temperature of 39° into a tall beaker, or tube, until it is nearly full and marking the surface line, one can easily show the expansion of water both as it is heated and as it is cooled. This is not true of salt water as that is densest at its freezing point, 29°.

The question will be asked how the air is warmed if not by direct insolation. The atmosphere absorbs a small proportion of the direct heat from the sun, and some of the radiated and reflected heat from the surface of the earth, but it is warmed to the greatest extent by conduction from the warmed surface of the earth and the objects upon it, and by convection between this warmed air and colder air. Therefore the air near the surface of the earth is warmest wherever the surface of the earth is warmest. This, in the summer time and in the daytime, will be over the land and wherever the solar rays are nearest vertical.

How is the air cooled? Heat radiates from all bodies constantly. When the receipt of heat is greater than the radiation the body is growing warmer. When the receipt of heat is less than the radiation the body is growing colder. Objects that are good absorbers are also good radiators; in general, dark bodies radiate heat more rapidly than light ones. Cut two cubes of ice of the same size and wrap one in a dark cloth and another in a light cloth of the same texture, and the one in the dark cloth will melt more quickly.

Take two tins, one bright and new and the other covered with lamp black. Put hot water in them and the water in the darkened tin will cool much more rapidly than the one in the bright tin.

Tea and coffee pots should be kept bright. The good steam engineer keeps his steam pipes bright and shining. The temperature of the air immediately over a dark colored lawn may be several degrees lower on a clear night than the air over a light colored lawn.

Ice is made during clear nights in dry weather in India and elsewhere by setting shallow, unglazed earthenware dishes on straw in the open air. The heat radiates very rapidly from the water, under the clear skies; the water is further cooled by the evaporation of water from the sides of the unglazed dishes; as they are set on straw heat can not be conducted to them from the ground beneath.

As the surface of the ground and the objects upon it are cooled by radiation at night, the air is cooled by convection and conduction of its heat to the cooled ground.

Moisture in the air, whether in visible or invisible form, absorbs radiation, and radiates in turn, so that heat radiated from the ground passes thru the air in clear nights, but is returned to the ground in damp, foggy, or cloudy nights.

Therefore the temperature of the air is lowest at night, and in winter time, over large land areas; and in clear still nights it is colder near the surface of the ground than at considerable distances above the ground. This is called inversion of temperature and this condition prevails on nearly every clear still night in winter or autumn, especially in valleys. It is under these conditions that by the drainage of cold air the temperature falls low enough in the valleys to cause a frost, while higher up on the hillsides there is no frost.

The air then is warmed by conduction from the warmed ground in the daytime, but at night it is cooled by the conduction of its heat to the ground that has been cooled by the radiation of its heat into space.

This leads up to the next important question, "What makes the wind blow?" The answer is, "difference in pressure". But what makes the difference in pressure? Two things—(1) difference in temperature together with the action of gravity, and (2) the rotation of the earth.

Let us consider that the air over a large land area and adjacent water area is in stable equilibrium and is still. The sun comes up, or the long days of summer come on, and the surface of the ground is heated faster than the surface of the water. The air in contact with the ground is heated by conduction, and it expands about 1/491 of its volume for each Fahrenheit degree of increase in temperature. In expanding it lifts the upper layers of the warm air over the land higher than the corresponding cool layers that are over the water.

Then under the action of gravity this higher air that has been lifted up over the land slides down onto the lower air that is over the water. This action decreases the pressure over the land and increases it over the water, and at once the surface air over the water is forced in toward the lighter air that is over the land, to equalize this difference in pressure, and so we have the surface action that we call "wind".

This is what causes the delightful sea breezes along the coast, the valley and mountain winds, and the monsoon winds that are best exemplified over India and the Indian Ocean. And this is what is taking place in a greater or lesser degree all over the globe wherever there is an unequal heating of the surface of the earth.

The pressure is greater and the barometer readings are higher in the winter time over the land of the temperate zone than over the water, and we have the drift of the air from the continents toward the oceans. In the summer time the reverse conditions prevail.

Looking at the globe as a whole, and considering the effect of the direct and the slanting rays of the sun, we may expect the air to be expanding and rising over the equatorial regions, overflowing above and moving out or sliding down toward the poles, then descending and flowing back toward the equator again. This is what is taking place, except that because of the rotation of the earth the centrifugal force is sufficient to force the air back, away from the centers of rotation, the poles, and pile it up at the Tropics.

Between the Tropics and the equator we have something of the ideal circulation. The air rises over the equatorial region, flows out overhead, down at the Tropics and back toward the equator as a surface wind. This surface wind is known as the "northeast trades" in the Northern Hemisphere, and the "southeast trades" in the Southern Hemisphere. But even here this ideal circulation is easily broken up and we often have strong surface currents flowing away from the equator.

Outside of the Tropics both the prevailing surface and elevated winds are from the west and there is no regular system of interchanging winds.

That there is no well developed upper current from the equatorial regions out over the temperature zones, was very well shown by the drifting dust and moisture from the explosion of the volcano Krakatoa, in the Straits of Sunda, in August, 1883. This dust drifted around the globe from east to west in fifteen days, but it took three or four months for it to drift from the Tropics northward over the temperate countries.

In all our discussion of the atmosphere, the movements of its currents and of the storm and fair weather areas, we must not lose sight of the extreme thinness of the shallow layer of air as compared with the horizontal distances that are under consideration. It is probable that there is a considerable atmosphere at 40 miles above the surface of the earth, but even at 10 miles above the earth the air is so thin and cold that it will not sustain human life.

At six miles above the earth in latitude 30°–50° the air is flowing steadily eastward at a velocity of 100 to 250 miles an hour, while practically all the atmospheric movements that cause our ordinary storms are within three miles of the surface of the earth.

Many of the storms shown on the daily weather maps control the weather from the Rocky Mountains to the Atlantic Ocean and from Canada to the Gulf. A storm influence covering a horizontal area fully 2000 miles in diameter may yet affect only an atmosphere less than three miles in thickness.

The next question that should receive our consideration in this chain of events that we are trying to link together, is the cause of rainfall.

The capacity of the air for moisture, or more properly speaking we should say the capacity of a vacuum for moisture, depends upon its temperature. At a temperature of 32° a cubic foot will hold 2.11 grains troy of water vapor. At 90° it will hold 14,790 grains troy, or over seven times as much as at 32°. If air at any temperature is completely saturated and is then cooled the moisture will be condensed and dew, fog, clouds, or rain will result. If air is three-fourths saturated its relative humidity is said to be 75 per cent. If air at a temperature of 80° and a relative humidity of 75 per cent is cooled down to 71.5°, its dew-point or point of saturation will be reached and condensation will take place, either as clouds or rain.

When the temperature of the vapor of the atmosphere is lowered to the point of saturation, condensation takes place about minute particles of dust and upon electric ions or electrons; or in the case of dew, upon the surface of the plants.

It is understood that nuclei of some kind are required for the formation of water drops, one nucleus for each drop. It has been found that when minute charges of electricity, carried on particles of matter which may be as small as one one-thousandth part of the mass of an atom of hydrogen, are introduced into a vessel of pure dry air and pure vapor of water, drops are able to condense.

Mr. John Aitken, who invented the dust counter, an apparatus for counting the dust particles in the atmosphere, believed that if there were no dust in the air there would be no fogs, no clouds, no mist, and probably no rain; that dustless air, when it became supersaturated would condense on all objects on the surface of the earth. Every blade of grass and every limb of a tree would drip with moisture deposited by the passing air. Our clothes would become wet and dripping, and umbrellas would be useless.

Such a condition is sometimes found to prevail on the summits of high mountains when the dust counter shows an extremely small amount of dust in the air. Some of the observations with Aitken's dust counter showed that in apparently clear air there were over two million dust particles in a cubic inch. In an ordinary room there were over thirty million, and in a Bunsen flame nearly five hundred million. "What must be the size of these!" says one writer. "Millions in a cubic inch, and yet so light that their united mass can not be weighed, and most of them invisible with the highest power microscope".

When air is comprest its temperature rises, and when it is expanded the temperature is lowered. When a body of air is raised 300 feet its temperature is lowered 1.6° because of the expansion of the air due to the lesser weight of the air above it. When a body of air is lowered 300 feet it is warmed by the same amount.

Therefore, when a moving current of air with a temperature of 80° and a dew-point of 70° is raised about one-third of a mile (2000 feet), clouds and possibly rain are produced. Air that is nearly saturated has to be raised very little to produce rain.

The conditions which produce the cooling of the air that is necessary for the formation of clouds and rain are:

1. The elevation of moist air and the consequent cooling by expansion.

2. Poleward moving masses of air, or a current of moist air from over the ocean moving on to the colder land.

3. Mixing of two masses of air of different temperatures.

Thus, wherever we have a body of moist air ascending rapidly, whether because of the release of pressure by the removal of air aloft or whether moving up the side of a mountain, or wherever we have a body of moist air moving onto colder land or moving far northward into a region of lower temperature, we have clouds and rain.

On the other hand, wherever we have a volume of descending air, either air settling down over a large area, or wind blowing down the leeward side of a mountain range, the air is being warmed by compression, its capacity for moisture is increasing and clear skies prevail.

The northeast monsoon winds over India give no rain because they are descending, warming and drying winds, while the southwest monsoon winds, because they are very warm and nearly saturated, give the heaviest rainfalls of the globe wherever they flow rapidly up the steep mountain side.

The extreme northwest coast of the State of Washington

has an average rainfall of over 100 inches a year, while just east of the mountain range in the central part of the State the fall is less than fifteen inches.

I have been telling you some facts that you may already be familiar with, but my purpose has been to help you grasp the correlation of these phenomena in a large way. The whole chain of events can be very briefly exprest.

The source of all our weather changes is the sun. Its radiant energy warms the surface of the globe unequally. The air is warmed by conduction from or cooled by conduction to the warmer or cooler ground, respectively. Vertical and horizontal currents are set up in the air because of its expansion by warming or contraction by cooling, and are modified by the rotation of the earth. Ascending currents of air are rainy, descending currents are dry. The temperature of any place depends upon the latitude, elevation, slope or aspect of the surface, proximity to land and water, and prevailing winds. The rainfall is influenced by topography, prevailing winds, and the character of the country over which the winds blow.

The present movement to increase interest in nature study in our schools is an excellent one. The most successful men have been those who are most practical, men who can understand and make the most out of their environments.

The country boy is often more successful than the city bred boy partially because he has developed habits of personal observation and experience—because he has had natural and not artificial things around him. He sees nature in a large way and is quick to grasp conditions and foresee results.

Therefore the educational movement to teach all children something of the principles of growth and the conditions that promote or retard growth in both the animal and vegetable kingdoms is an excellent one.

We frequently hear of the college professor who pulled up his beans and planted them over again because they were coming wrong end up. Only a few days ago I read of the finding of a gate high up in a tree not far from Johnstown, Pa. The explanation given in the paper was that the gate had been carried down the stream during the damaging floods of a number of years ago, had lodged in the limbs of a small tree, and had been carried to its present great height as the tree had grown up. When your present nature-study plans have been fully developed no boy will grow up in such ignorance of the principles of plant growth as was indicated by this article. In all of your teaching in this direction the weather enters into your scheme more than any other factor, and it is one of the easiest to get valuable illustrations from.

The relation between the weather and the growth and yield of crops is very important from a practical point of view. For example, Professor Gibbs, of New Hampshire, and myself have determined that the yield of corn in the United States depends largely upon the July rainfall. From investigations in Ohio I have demonstrated that the poorest yields of oats are with warm, wet summers, and the best yields with cool, dry summers. Barley, on the other hand, does best in warm and dry weather and poorest in cool and wet summers. In South Australia, where they have 8 to 10 inches of rainfall a year, they can keep only 8 or 9 sheep for each square mile. In New South Wales, where the rainfall is 13 inches, they can keep 96 sheep on a square mile, and where it is 20 inches, 640 sheep. In Buenos Ayres, where the annual rainfall amounts to 34 inches, they can keep 2630 sheep on each square mile.

In Jamaica, when the rainfall for any year averages 56 inches, the average sugar export during the following season is 1441 casks per acre; when the rainfall is 76 inches, the export is 1559 casks, or about one-tenth more. This means an increase in the value of the sugar crop of about $400,000.

In Canada the school children have been encouraged to notice and report the blossoming of plants, leafing of trees, the coming of birds and insects, and the progress of farm work, to a far greater extent than has been done in the United States. They have a list of over one hundred things that can be reported on, and the school that makes the greatest number of reports and the individual scholar that makes the greatest number of reports is awarded a prize.

Observations of this character should be encouraged, and if any teacher wishes to take up such observations I shall be glad to assist in arranging the plan and the subjects to be considered.

All teachers in this State should take advantage of the agricultural extension work offered by the Ohio State University under the direction of Prof. A. B. Graham. The Agricultural Extension Bulletin that he publishes is of remarkable helpfulness in suggesting and directing plans and methods. Phenology, as it is called, relates to the study of the relation between weather and vegetation or animals, and one of the most fascinating branches of the study is that which relates to the effect of the weather on man.

Every teacher has experienced "cross-grained" or unruly days, when everything goes wrong, and it is probable that you have ascribed the trouble in some indefinite way as being due to the weather. But has it ever occurred to you that you might take some observations along this line that might be of direct value to science and to humanity?

During London fogs, and on days when the weather is particularly depressing, it is said that in the Bank of England, certain sets of books, an error in which would be accumulative and produce disastrous results farther on, are locked up, and the clerks set at tasks less intricate and important in character.

The same necessity for a cessation of certain lines of work during bad spells of weather is recognized by the large banking institutions in New York and other cities.

The head of a factory employing 3000 workman has said: "We reckon that a disagreeable day yields about 10 per cent less work than a delightful day, and we thus have to count this factor in our profit and loss account". But what is an "unfavorable" day and what is a "delightful" day? Prof. Cleveland Abbe, of Washington, and Mr. W. F. Tyler, of Shanghai, have suggested that we make out personal weather curves, of comfort or discomfort, by recording the different weather elements on days when we feel perfectly comfortable or exceedingly uncomfortable, unusually deprest or unduly elated.

Prof. Edwin Grant Dexter has investigated this subject quite carefully and has evolved many very interesting conclusions.

A RARE CUMULUS CLOUD OF LENTICULAR FORM.

By HENRY HELM CLAYTON. Dated Blue Hill Observatory, Hyde Park, Mass., May 8, 1906.

The accompanying figures 1, 2, and 3[1] present a rare cloud form photographed by Mr. Frederick Endicott, of Canton, Mass.,[2] about 1 p. m., on April 22, 1898. The form is one which has been named "lenticular cumulus" by Clement

[1] The same chimney pots appear in each of the photographs; in fig. 1 they are at the right edge, in fig. 2 somewhat to the left of the middle line, and in fig. 3 they are at the left edge. In fig. 1 a windmill shows the direction of the wind. The clouds moved in the same general direction. The cloud at the right in fig. 1 is the same as that on the left in fig. 2, and the cloud at the right in fig. 2 is the same as that at the right in fig. 3. The times of exposure were evidently in the order of the figures, 1, 2, and 3, since in each case the clouds drifted in the direction from the chimney pots indicated by the windmill.

The arrangement of the bases of the clouds in parallel bands shown on the right and on the left of figs. 1 and 2 indicates the presence of large atmospheric waves, of which these clouds probably formed the crest. This arrangement of the clouds in parallel bands is not uncommon in the case of ordinary cumulus. It is possible that the striations in the cloud were in some way related to the atmospheric waves.

[2] About three miles south-southwest of Blue Hill, Mass.

Ley. Clouds of this type are occasionally seen at Blue Hill and have been found associated with shallow secondaries in some part of a larger cyclone. In the present example the cloud resembles, but is not exactly like, the usual lenticular cumulus. It differs from the usual form in the fact that it appears to be composed of separate layers or thin plates growing smaller in diameter up to an apex at the top. It is the only example of this kind I have seen in twenty years of observation at Blue Hill, and I was very glad to learn that Mr. Endicott had succeeded in getting photographs of it. The photographs were taken at a point about three miles south-southwest of Blue Hill. These clouds were watched by me for several hours on the afternoon of April 22. They were found to be changing their forms slowly—not rapidly, like the ordinary cumulus. Blue Hill at the time was in the southern quadrant of an area of low pressure central off Nova Scotia. A second area of low pressure was approaching from the Mississippi Valley. The weather conditions at Blue Hill Observatory were a pressure about normal, a brisk west wind, a temperature of 57° F. and a dew-point of 26° F. Above the lenticular cumulus the sky was nearly covered with cirro-stratus. The cause of this particular cloud appears to have been local currents ascending from the heated ground like those which form ordinary cumulus, but the ascending currents had lost the turbulent uprush which forms the vortices and eddies of the ordinary cumulus. The condensation took place in thin disks which slowly pushed upward and evaporated.

The condition which favored the formation of this lenticular cloud was probably a condition in which the adiabatic rate of cooling for dry air extended to a great height, and the gradient went over by a gradual change from the adiabatic to the nonadiabatic condition, instead of suddenly as in the case of ordinary cumulus.

Knowing the temperature and the dew-point at the surface, the height of the base of the cloud can be computed, and is found to be about 2200 meters above Blue Hill, or 2400 meters above the adjacent sea level. This height is about twice that of ordinary cumulus. The reason that such clouds are rare is that it is very rare for the adiabatic rate of dry air to extend to so great a height. During the twelve years that observations with kites have been in progress at Blue Hill, only once has the adiabatic rate of dry air been found to extend upward to approximately this height from the ground. In that case also lenticular and turreted cumulus were observed. In the ordinary case, the ascending currents from the ground are interrupted in the midst of their uprush by an inverted gradient of temperature, caused by an overlying, potentially warmer stratum of air, at a height of some 500 to 1500 meters. I have found from the observations with kites that the stronger ascending currents, on account of their inertia, pass somewhat beyond the level of the inverted gradient and enter the warmer stratum, only to sink back again, so that quickly disappearing fracto-cumulus clouds sometimes form just above the level of the inverted gradient of temperature. These clouds are in such cases colder than the air at the same level, sometimes, indeed, as much as 10° colder. But as a rule this inverted gradient limits the height of the ascent of the locally heated, ascending columns of air, and, if the air is not damp enough to form cumulus clouds before the level of the inverted gradient is reached, none appear. For this reason the cumulus is usually found at the top of a turbulent uprush within 1500 meters of the ground, and not at a great height where the ascending currents have nearly exhausted their energy of ascent. After condensation begins in a cumulus cloud the rate of decrease of the temperature with height is much slower, so that the air currents can continue to rise through overlying strata where the decrease of temperature is comparatively slow, the ascent even going to very great heights as in shower clouds.

THE CAP CLOUD.

The preceding communication from Mr. Clayton, with the photographs by Mr. Endicott, relates to a form of cloud analogous to one that has been frequently observed by the Editor, and more especially during the cruise of the *Pensacola*, or the so-called U. S. Scientific Expedition to the west coast of Africa. One form of it was seen late in October, 1889, when we were lying at anchor off Horta, and the cloud itself enveloped the summit of Pico. The same form was seen very frequently in February, 1890, about 6 p. m., above the top of the mass of cumulus clouds that enveloped the summit of Green Mountain, on the island of Ascension, and in fact, on several occasions, it was seen to form like a shallow inverted saucer in mid-air, when no cumulus was in immediate contact. It was again seen in April, 1890, above great cumuli over the Bermudas. It was not seen in the drier climates of the African coasts, nor at any point within the United States, since I began to note cloud formations, in 1856. I had, therefore, formed the opinion that this "cap cloud", as I have always called it, was formed in a layer of very moist air, moving slowly, with very gentle vertical gradients and at very considerable altitudes. Such a moist current, flowing gently over the summit of Pico, late in the afternoon or early in the evening, when ascending currents from the warm ground are quite gentle, must itself be free from vortices or any other form of discontinuous motion, and must be characterized by what Kelvin calls lamellar motion, so that the successive layers of air, one above the other, move in gentle curves parallel to each other and, if they are pushed up high enough, become layers of delicate white cloud. The horizontal streaks and serrated or ragged ends of the clouds, as photographed by Mr. Endicott, were, I believe, always present in my cap clouds, and sometimes to a very marked degree; but I could never quite satisfy myself that in the cap cloud there really were several distinct layers superposed with intervening clear spaces, though the appearance suggested that this could easily have been the case.

Passing from the phenomenon over Pico to the regular daily appearance of the cap cloud over the cumuli at the island of Ascension, it was easily seen that the uprising column of air, constituting a cumulus, acts as an obstacle to the horizontal movement of the layer of air into which it intrudes. This layer must, therefore, rise slightly in order to surmount the obstacle, and in doing so forms a shallow inverted saucer cloud, whose only connection with the cumulus is that it surmounts the latter, being in fact formed in its own layer of air and often high above the obstacle. If the top of the cumulus is quite high and close to the cap cloud, there may seem to be no separation between them. I have recorded cases in which the standing waves of wind always present in the southeast trade to the leeward of Green Mountain, on Ascension, did not give rise to cumulus clouds in the late afternoon and early evening, because then there is no great vertical movement of moist air from the ocean surface. In such cases the summits of these invisible waves were surmounted by the saucer or cap cloud, standing still as a beautiful white object in mid-air—reminding one, in fact, of the ghosts of clouds after the sun has set and the great cumuli of daytime have disappeared.

As the conditions necessary to produce a gentle upward deflection—namely, moist air and steady horizontal winds at great elevations, the absence of strong vertical convection at those altitudes, and the presence of a mountain or a cumulus cloud mass—are not often conjoined, I think we may thus explain the rarity of this cloud in the Middle and Eastern States.

The umbrella clouds of M. Streit (Meteorologische Zeitschrift, January, 1896, Vol. XIII, p. 14) and W. D. Johnson (MONTHLY WEATHER REVIEW, May, 1898, Vol. XXVI, p. 207), the mushroom clouds of Professor Dr. Laska (Meteorologische Zeitschrift, January, 1899, Vol. XVI, p. 23), and the pyramid of

cloud layers recorded by Hann (Meteorologische Zeitschrift, January, 1899, Vol. XVI, p. 25) all show that shallow cloudy layers may be produced by gentle overflow from the top of an ascending column of air, so that analogous clouds may be produced in various ways. We must, therefore, keep in mind the difference in origin between cap clouds and mushroom clouds.—*C. A.*

FIG. 1.—Lenticular cumulus.

FIG. 3.—Lenticular cumulus.

ABNORMAL WEATHER OVER SOUTHERN TEXAS.

By JOSEPH L. CLINE, Observer, Weather Bureau.
(Dated Corpus Christi, November 22, 1906.)

On Saturday, November 17, 1906, there was an area of low barometer over central Texas that caused abnormally high temperatures and clear weather over the southeastern portion of that State, while almost freezing and unsettled conditions prevailed over northwestern Texas. The maximum temperature on that date at Corpus Christi, was 91° F.; being 2° F. higher than the absolute maximum for the month of November since that station was established in February, 1887, and 1° to 3° F. higher than the maximum temperature for a great many of the months of July and August.

A cool wave of marked intensity followed this warm period and crost Texas on November 19. At 8 a. m.[1] of this date the barometric depression referred to above was central over the lower Rio Grande Valley, while the high barometer area and cool wave was central over southeastern Montana and extended east to the Mississippi Valley and south across the United States to central Texas, where it was raining, while it was snow-

[1] Seventy-fifth meridian time.

ing over the extreme northwestern portion of that State and over several States north of Texas. The temperature in Texas at the time ranged from 16° F. over the panhandle to 74° F. along the coast. The disturbance that was over the lower

FIG. 2.—Lenticular cumulus.

Rio Grande Valley moved east-northeast along the west Gulf coast to the Mississippi Valley and then moved northward. The cool wave, or norther, as they call it in Texas, struck Corpus Christi at 12:45 p. m. of the 19th, when the wind suddenly shifted from the east to the northwest, and rapidly increased in velocity, causing the temperature to fall nearly 20° F. in two hours. The accompanying dense black cloud, that always warns the inhabitants of an approaching norther, came from the west-northwest, which was unusual, as they almost invariably come from the north and northwest. The cool wave, or norther, did not reach Galveston, Tex., until about 11 p. m. of the 19th. From this it can be observed that the norther struck Galveston, a station located about 200 miles east and 100 miles north of Corpus Christi, ten hours after it struck the latter city, which is unusual, as they generally strike the former station about the same time and sometimes earlier than the latter.

The temperature at 8 p. m. of the 19th was 48° F. at Corpus Christi, while it was 74° F. at Galveston, and the writer, during his fourteen years' service in Texas, has never observed such conditions prior to this time.

The temperature at Corpus Christi fell from a maximum of 77° F. on the 19th to a minimum of 37° F. on the 20th. Such sudden and decided changes are rare over southern Texas. The minimum temperature at Corpus Christi on the morning of November 21 was 33° F., being the lowest temperature on record so early in the fall. Heavy frost occurred and thin ice formed almost to the Gulf shore. All tender vegetation, such as beans, cucumbers, and tomatoes, was killed in the vicinity of Corpus Christi, while cabbage, lettuce, beets, etc., were hardly damaged.

An amusing feature in connection with the cool wave was that there were many northern prospecters and homeseekers in Corpus Christi, and in conversation with citizens they would remark that they had been informed that it never froze and hardly ever frosted in southern Texas. Invariably the citizens would say: "It does not, but you people came down from the North and brought this with you".

DO CLIMATES CHANGE?

Those who are interested in climatology, as distinguished from meteorology, should have their attention directed toward the numerous excellent articles published by Prof. R. De C. Ward. Among these we have already noted a comprehensive series on the classification of climates.[1] In addition to this there is a paper on "Changes of climate", in the Popular Science Monthly for November; and a series of papers on "The characteristics of the zones", now being published in the Journal of Geography.

With regard to changes of climate Professor Ward says:

> Changes of climate in the geological past are known with absolute certainty to have taken place: periods of glacial invasions as well as periods of more genial conditions. The evidence and the causes of these changes have been discust and rediscust by writers almost without number and from all points of view. Changes in the intensity of insolation, in the sun itself, in the condition of the earth's atmosphere, in the astronomical relations of earth and sun, in the distribution of land and water, in the position of the earth's axis, in the altitude of the land, in the presence of volcanic dust, changes now in cosmic now in terrestrial conditions, have been suggested, combated, put forward again. No one of these hypotheses has prevailed in preference to others. No actual proof of the correctness of this or that theory has been brought forward. No general agreement has been reached. Under these conditions, and in view of the fact that practical climatology is concerned with climatic changes not of the geological past but of the historical present, this portion of our subject may be dismist with this brief mention.
>
> There is a widespread popular belief in permanent, progressive changes of climate during a generation or two. This belief is not supported by the facts of meteorological record. Abundant evidence has been adduced in favor of secular changes of climate in historical times. Much of this is unreliable, contradictory, and has been interpreted without sufficient regard to possible controls other than climatic change. Without denying the possibility, or even the probability, of the establishment of the fact of secular changes, there is as yet no sufficient warrant for believing in considerable permanent changes over large areas. Dufour, after a thoro study of all available evidence, has concluded that a change of climate has not been proved. There are periodic oscillations of slight amount. An eleven-year period has been made out with more or less certainty for some of the meteorological elements, but it has been of no practical importance as yet. A thirty-five-year period is less uncertain, but is nevertheless of considerable irregularity, and can not as yet be practically applied in forecasting. Longer periods are suggested, but not made out. As to causes, variations in solar activity are naturally receiving attention, and the results thus far are promising. But climate is a great complex, and complete and satisfactory explana-

[1] Monthly Weather Review, September, 1906, Vol. XXXIV, p. 416.

tions of all the facts will be difficult, perhaps impossible, to reach. At present, indeed, the facts which call for explanation are still in most cases but poorly determined, and the processes at work are insufficiently understood. Climate is not absolutely a constant. The pendulum swings to the right and to the left. And its swing is as far to the right as to the left. Each generation lives thru a part of one or two or even three oscillations. A snap-shot view of these oscillations makes them seem permanent. As Supan has well said, it was formerly believed that climate changes locally, but progressively and permanently. It is now believed that oscillations of climate are limited in time, but occur over wide areas. Finally, it is clear that man, whether by reforestation or deforestation, by flooding a desert or by draining a swamp, can produce no important or extended modifications of natural climate, which is governed by factors beyond human control.

CLIMATOLOGICAL DATA FOR VIRGINIA.

Mr. Edward A. Evans, Section Director of the Climatological Service in Virginia, has published in the annual report of that section for the year 1905 a short index to the special articles which have been printed in the reports of that section, from the first issue in July, 1891, to the end of the year 1905. About forty titles are mentioned in the list; among them are the following:

Title.	Date of report.
Heated periods	July, August, 1900.
Hydrographs of James River at Richmond, Va	Annual, 1898–1905.
James River freshets	Annual, 1901.
Long-record meteorological data at various stations	January, 1904–Febru'y, 1905.
(Similar synopses are included in all issues to date of the year 1906.)	
Notes on James River freshet of April 21–22, 1901	April, 1901.
Notes on freshets in James River during 1902	Annual, 1902.
Precipitation, heavy, remarks on	June, August, 1901.
Report on thunderstorm at Lincoln, Va	June, 1903.
Table of James River freshets, 1893–1896	Annual, 1900.
Table of flood rises in James River, 1870 to 1892	Annual, 1900.

A list and accompanying map [not reproduced] are also given showing every station in Virginia at which meteorological observations are known to have been taken in the past, but are not now taken. This supplements the regular list and map which show only the stations now reporting to the section center. The list of almost a hundred discontinued stations gives the years which their records cover, and states whether the records comprise temperature or precipitation, or both.

The oldest record mentioned is the temperature record at Bellona Arsenal, Chesterfield County, for the years 1824 to 1833. This, unfortunately, like most others, is incomplete even for the years mentioned. The record at Fort Monroe is next in age, and is the longest record of all (1825 to 1874, for temperature, while the precipitation record is from 1836 to 1890); but again the record is incomplete. Other places with records extending over periods of fifteen years, or more, are Accotink, Birdsnest, Christiansburg, Falls Church, Goshen, Lewinsville, Mount Solon, Powhatan Hill, Smithfield, and Snowville.

Beginning with January, 1906, Mr. Evans has been printing each month in the section report a climatological summary of all data for stations having sufficient record to sum up in this way, together with a little text covering the general character of the record, names, and period of incumbency of observers, location and exposure of instruments, etc. This he finds useful in stimulating the interest of observers in keeping up their records.

LAND AND SEA WINDS.

Dr. Max. Kaiser, of Halle, Germany, has just published a memoir on "The Land and Sea Winds of the Baltic Coast of Germany". This appears as a dissertation for the attainment of the degree of doctor of philosophy, and has been prepared under the special stimulus of Professor Doctor Brückner at the university, and also by the cooperation of Professor Doctor Köppen and Professor Doctor Grossmann of the Deutsche Seewarte at Hamburg, to which place Doctor Kaiser repaired in order to obtain the necessary observational data. In the preface to the present memoir the author regrets that we have so few special studies of the land and sea breezes in the temperate zones. He mentions, with especial approval, the work of Prof. William M. Davis of Harvard on the sea breezes of New England. Apparently Doctor Kaiser does not know of the elaborate memoir of Francis E. Loomis, the son of Prof. Elias Loomis, on the winds of New Haven, nor of the memoirs on the winds of our coast by Mr. T. H. Davis in the MONTHLY WEATHER REVIEW, Volume XXX, pages 261 and 519, which have been followed by another paper in the September REVIEW. A great amount of material on this subject is also found in that monumental work, "The Winds of the Globe," by James H. Coffin, published by the Smithsonian Institution.

The studies of Doctor Kaiser relate to the years 1901–1905, and to anemograms registered at five stations on the German coast of the Baltic Sea, namely at Memel, Pillau, Neufahrwasser, Rugenwaldermunde, and Swinemunde. The coast line from the first to the last of these stations stretches from the east-northeast toward the west-southwest for about two hundred and fifty miles; it is a comparatively low and flat coast, like the country for a long distance to the southward and eastward. In connection with the observations of the wind the author has also studied the barometric gradient between the land and the water, using the daily barometric observations at the lightship off Adlergrund, which ship is about fifty miles from the coast and sixty miles north of the anemograph at Swinemunde. Much use was also made of the weather records kept on board many German ships traveling along this coast, and these enabled the author to get a clear idea of the conditions prevailing at the moment when the sea breeze began.

To give precision to our ideas Doctor Kaiser begins by stating that by land and sea breezes he understands only those that are caused by the differences in temperature between the land and the sea, and that change decidedly with the time of day. He has, therefore, with the help of the anemograms, selected those special days that show an appropriate change in the direction of the wind, and which the synoptic charts also show to have had small barometric gradients, feeble winds, and comparatively clear sky. On such days as these, which are the only ones that he studies for diurnal effects, the wind blows from the land in the early morning, but from the water between midday and the evening, and again from the land during the later evening. The beginning and the duration of the sea breeze is very variable; often it begins as early as 8 a. m., but often, also, as late as 2 p. m. The reason for this is to be found in peculiarities of temperature, of pressure, and of cloudiness, to which subject a large part of the memoir is devoted. On the average the duration of the sea breeze is longer during the summer months than during the rest of the year.

The velocity of the sea breeze, on the average, is from two to three meters per second. The maximum velocity occurs between 2 and 4 p. m., or near the time of the maximum temperature. The number of days on which the sea breeze, strictly so-called, occurs varies in any single month, for any single station, between 6 and 26 per cent of the number of days in the month; the following figures represent the average percentages of five years for the five stations along this part of the Baltic coast: April, 7; May, 13; June, 15; July, 19; August, 17; September, 14. The sea breeze does not occur in the remaining months from October to March, since during these months the sea is always warmer than the land, and there can therefore be no diurnal exchange of wind. In general the frequency of

the sea breeze along this coast is very much less than the 38 per cent given by Davis for the New England coast; but this is largely because in the present investigation Kaiser has used only the days that show a land wind early in the morning and late in the evening, with a sea breeze in the immediate afternoon. These are, therefore, days with both sea and land wind, whereas Davis has considered principally the occurrence of the sea breeze. The geographic distribution of the sea breeze in this region differs in some respects from that found by students in other localities. When we chart the sea breezes observed at all of Kaiser's stations, we find that the bay in which Pillau is located experiences its sea breeze much later than the rest of the coast, and the same is true to a less extent of the bays represented by Swinemunde and Labagienen. At Neufahrwasser the sea breeze begins two hours later than at the two other stations, owing to its being protected by a cape jutting out to the northward.

With regard to the veering and backing of the wind there is considerable irregularity. The veering with the sun occurs only occasionally on this coast. There are four ways in which the wind may change: (1) continuous turning toward the right; (2) turning toward the right, followed by a backward motion toward the left; (3) continuous turning toward the left (backing), and (4) turning toward the left, followed by a retrogression or turning back toward the right. An examination of all the changes of the wind at the five Baltic stations shows that the third method almost never occurs, but the other three methods occur in about equal proportions. The rate at which the wind changes direction has been computed by Doctor Kaiser as an hourly rate, and varies between 0° and 28° per hour for changes toward the right, and from 0° to 47° per hour for changes toward the left. The change of direction when the sea breeze sets in is comparatively large, but the hourly change when it has attained its maximum strength is small.

The difference of pressure at sea level between two stations when the sea breeze is blowing is quite appreciable, amounting to fully half a millimeter of the mercurial barometer in the gradient between Swinemunde and the lightship, a hundred kilometers or sixty miles distant to the north, but becoming zero at the time when the land breeze or sea breeze dies away. We believe that this is the first time that these barometric gradients have been determined; we have often called attention to the fact that the air is so mobile that direct pressure gradients which are inappreciable to ordinary meteorological observations will suffice to make a strong wind, and that the gradients ordinarily shown on the weather maps, which are largely perpendicular to the direction of the wind, are the result of the centrifugal force of the wind on the rotating earth. Such slight gradients as those that drive the air thru a pneumatic tube are ordinarily neglected in meteorology, but we see them exemplified in the present case, where the gradient of a half millimeter per hundred kilometers produces a land breeze, or a sea breeze, of six meters per second. The difference of temperature of the air over the land and the sea for two stations nearly corresponding to those just mentioned was 5.7° C. at its maximum, and as this occurs at the time when the difference of pressure is the greatest and the sea breeze is the strongest Doctor Kaiser considers it to be the cause of these latter.

With regard to the distance to which the sea breeze extends landward or seaward, or the boundary between the region of land breeze and sea breeze, the author makes use of observations on board numerous ships. He finds that in general it is certain that on the German Baltic the sea breeze begins between four and five nautical miles from the coast, and that in its turn the land wind stretches even farther seaward; on the most favorable days the land wind may stretch eight nautical miles seaward. These figures relate to clear, cloudless sky. It seems impossible now to determine how far the sea breeze extends inward over the land, since the interior stations have no continuous records; but we may assume that the sea breeze penetrates comparatively far inland on account of the flatness of the country, and it may be as far as twenty or thirty kilometers, judging by comparison with the conditions on the New England coast.—*C. A.*

MONTHLY REVIEW OF THE PROGRESS OF CLIMATOLOGY THRUOUT THE WORLD.

By C. FITZHUGH TALMAN, U. S. Weather Bureau.

METEOROLOGICAL STATIONS IN ICELAND.

The accompanying chart, fig. 1, shows the distribution of the meteorological stations now in operation in Iceland. For the revision of this chart to October, 1906, the writer is indebted to the courtesy of Mr. L. V. S. Willaume–Jantzen, Subdirector of the Danish Meteorological Institute.

FIG. 1.—Meteorological stations in Iceland.

Elements observed: ⊕ Temperature. ⊙ Temperature and pressure. Many stations also observe wind, atmospheric humidity, and precipitation. Italics denote stations for which normals of any element have been published. (See text.)

The results of observations at the stations in Iceland are published annually in the second part of the Meteorologisk Aarbog of the Danish Meteorological Institute.

The stations whose names are italicized are those for which normals, of one element or more, have been published. The following are the principal collections of normals for Iceland:

Denmark. Danske meteorologiske Institut. Meteorologiske Middeltal og Extremer for Fâeroerne, Island og Gronland. (Appendix til det danske meteorologiske Instituts Aarbog 1895, II Del.). Kjobenhavn, 1899.

Willaume–Jantzen, V. Climat du littoral islandais. (Extr. Congrès maritime international de Copenhague, 1902.)

For Stykkisholm the best normals are those of J. Hann. See his important studies of the meteorology of Stykkisholm in Sitzungsberichte der mathematisch-naturwissenschaftlichen Klasse der kaiserlichen Akademie der Wissenschaften, Vienna, 113 Bd., Abt. IIa, 1904, pp. 183–269, and Meteorologische Zeitschrift, Jahrg. 22, 1905, pp. 354–357.

Normals for Reykjavik, the capital of Iceland, from a series of observations made 1823–1837, appear in the Zeitschrift der österreichischen Gesellschaft für Meteorologie, Bd. 6, 1871, p. 45. Normals from a later series appear in Buchan's "Report on Atmospheric Circulation".

Temperature normals for the following stations not shown on the accompanying chart are also given in Buchan's "Report

on Atmospheric Circulation": Flatey, Siglufjore, Skagerstrand.

CLIMATE OF BRITISH EAST AFRICA.

A recent British Colonial Report (Annual, No. 475) contains the following sketch of the climate of the British East Africa Protectorate:

Climatically, British East Africa, which extends approximately from 5° south to 4° north latitude, may be divided into three zones:

1. *The coast.*—The coast strip, including the valleys of the three principal rivers, the Sabaki, the Tana, and the Juba. This is essentially tropical. The atmosphere is always charged with a considerable amount of moisture, but the temperature is equable and never very high. From June to December, during the prevalence of the southwest monsoon, residence on the coast is far from unpleasant, and although it is hotter during the other six months of the year, the nights are always fairly cool. On the whole the health of the coast belt is good; there is very little malaria, and yellow fever—the scourge of the tropical coasts of the Western Hemisphere—is unknown. Farther inland, in the scrub country and in the river valleys, the effect of the sea breeze is lost, and the climate is hotter and less agreeable. Malaria is also more common, but can not be said to be very prevalent or of a severe type.

2. *The highlands.*—Leaving the coast belt a gradual rise is experienced till an altitude of 9000 feet above sea level is reached on the Mau, or 18,000 on snow-clad Mount Kenia. On the whole of these uplands the climate is excellent, healthy, and invigorating. Although the sun is fairly strong in the middle of the day, European clothing can be worn all the year round, and the nights are cold enough to render the use of two or more blankets indispensable. The fact that children born and bred on these high plateaux grow up rosy and robust is sufficient evidence of the excellence of the climate.

3. *The district around Lake Victoria Nyanza.*—From the highlands a somewhat rapid descent is made to the depression in which lies Lake Victoria. This is 3680 feet above sea level, and a tropical climate is again met with. It is hot, and owing to the vicinity of high hills thunderstorms are of frequent occurrence. The climatic conditions are less favorable [to health], and at certain seasons of the year malarial and hæmoglobinuric fevers are not infrequent.

TABLE 1.—*Rainfall summary, British East Africa, 1896–1904.*

Station.	Length of record.	Average rainfall.	Station.	Length of record.	Average rainfall.
	Years.	*Inches.*		*Years.*	*Inches.*
Kismayu	9	14.66	Machakos	7	35.82
Malindi	7	36.07	Nairobi	5	36.24
Takaungu	6	45.55	Fort Hall	4	48.21
Mombasa	6	51.95	Eldama Ravine	2	37.80
Shimoni	8	56.28	Mumias	5	73.42
Mwatate	2	22.66	Kisumu	2	51.23

CLIMATE OF TULAGI, SOLOMON ISLANDS.

From the latest colonial report on British Solomon Islands (annual, No. 461), we extract the following table of rainfall as recorded at the government station at Tulagi, together with a brief sketch of the climate.

TABLE 2.—*Rainfall of Tulagi, Solomon Islands, 1897–1905.*

Month.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Mean: 1898–1904.
January	.....	9.51	14.27	12.20	10.93	18.31	3.96	14.78	5.62	11.99
February	.....	28.55	12.04	3.09	12.46	27.76	14.12	17.61	21.20	16.52
March	.....	27.89	17.47	13.48	10.83	22.30	10.73	23.49	.....	18.04
April	.....	6.67	20.48	2.29	6.75	8.53	5.68	6.75	.....	8.16
May	.....	4.19	8.85	5.83	17.39	4.53	3.84	10.77	.....	7.95
June	.....	4.86	1.26	3.20	10.69	7.85	7.99	2.12	.....	5.42
July	.....	4.86	24.27	3.24	5.53	9.02	7.79	4.32	.....	8.43
August	.....	9.94	8.33	3.01	13.24	14.70	14.28	8.91	.....	10.34
September	.....	10.53	10.92	5.41	10.35	6.25	10.03	5.53	.....	8.44
October	2.91	10.23	11.21	9.12	15.60	6.65	10.39	7.01	.....	10.03
November	5.66	21.14	7.89	10.62	7.97	6.83	10.69	3.35	.....	9.78
December	11.03	8.97	19.03	10.83	11.91	9.86	16.76	6.00	.....	11.91
Year	.....	147.39	156.02	82.33	133.85	142.70	116.26	110.64	.....	127.03

It will be gathered from the table that the months from December to March, the season of the northeast monsoon, are the wettest, and that the months from April to September, the season of the southeast trade wind, are those during which less rain falls. No period of the year can, however, rightly be called a dry season. June appears to be the month when least rain is to be expected. The septennial average for July is affected by the abnormal rainfall for that month recorded during the year 1899, when about 17 inches of rain fell in two days. This appears to have been an altogether exceptional phenomenon. The comparatively small total for the year 1900 is remarkable when compared with the annual totals for the remainder of the septennial period.

The southeast trade-wind season may be said to set in during March or April and to continue until November. During the months from November to March long periods of calm weather are experienced, varied by westerly and northwesterly winds, which sometimes blow with considerable force; but cyclonic storms, such as prevail during this season in more southerly latitudes, are unknown in the Solomons.

In the absence of proper instruments it has been impossible to keep any record of temperature or barometric pressure. A thermometer on the veranda at the government residence at Tulagi, about 220 feet above sea level, has never recorded a lower night temperature than 73° F., and during the cooler months, June to September, rises to about 86° to 88° during the day. During the hot months, December to February, a temperature of 92° has occasionally been observed when the heat has not been tempered by a breeze off the sea.

THE CLIMATE OF SEISTAN.

Col. Sir Henry McMahon, head of the British Seistan Mission of 1903–5, contributes some interesting notes on the climate of that region to the September and October, 1906, numbers of the Geographical Journal.

Seistan, as Lord Curzon has recently remarked, is "famous for a wind, the most vile and abominable in the universe".

Colonel McMahon says:

If ever a country merits the title of "land of the winds" it is Seistan. Everyone who has visited Seistan, or written about Seistan, has mentioned its celebrated wind, called the "Bad-i-sad-o-bist roz", or wind of 120 days, which blows in the summer. Few of these have had the misfortune to experience it, but as we went through two seasons of this wind we are able to say something about it. It more than justifies its reputation. It sets in at the end of May, or the middle of June, and blows with appalling violence and with little or no cessation till about the end of September. It always blows from one direction, a little west of north (between 316½° and 333¾°), and reaches a velocity of over 70 miles an hour. It creates a pandemonium of noise, sand, and dust, and for a time gets on one's nerves; but it is in reality a blessing in disguise, for it blows away the insects, which from April to June make life in Seistan a perfect purgatory, mitigates the awful summer heat, and clears the country of typhus, smallpox, and other diseases rife in the country in May and June. This Bad-i-sad-o-bist roz is not felt in the mountainous country west and northwest of Seistan. It is said to be even more violent in Lash Jowain than in Seistan. It is less violent in Herat, and rapidly decreases in violence south of Seistan.

One would think this 120-day wind enough, but violent winds prevail all through the winter from December to April, and blizzards are of constant occurrence. These winds always come from the same direction. The winter blizzards are terrible, and the wind attains a terrific velocity. In a blizzard at the end of March, 1905, the anemometers registered a maximum of 120 miles an hour. The average velocity for a whole sixteen hours was over 88 miles an hour.

The effects of the wind are everywhere visible in Seistan. Everything looks wind-swept and wind-stricken. Over the greater part of the country not a single tree exists. The present villages and habitations are all built with their backs presenting lines of dead wall on the windward side. The old ruins are oriented at exactly the same angle, on account of the wind.

The wind has buried large tracts of country under sand. Many of the old ruined towns are wholly or partly buried in sand, and this burying process goes on all the year and every year, and is covering up not only valuable lands, but inhabited villages.

Seistan has only two seasons, winter and summer; spring and autumn do not exist. One jumps within a few hours from cold winter into hot summer, and from hot summer into cold winter. The summer lasts from April to November, seven months, and is a long weary period of cloudless sky and great heat, which reaches a maximum in the shade for many months of 110° to 119° F.

We learn from the last administrative report of the Indian Meteorological Department that the Seistan Mission has presented to that department meteorological records extending from June, 1903, to May, 1905, together with a note on the climate of Seistan by Colonel McMahon.

Another recent account of the climate of Seistan is that of Mr. Ellsworth Huntington, contained in Publication No. 26 of the Carnegie Institution, "Explorations in Turkestan, with an Account of the Basin of Eastern Persia and Seistan" (Washington, 1905), p. 227.

REPRINTS OF WORKS ON METEOROLOGY.

We have quite lately learned that the friends of science in Japan have taken steps toward the reprinting of the mathematical works of Prof. Dr. Diro Kitao, professor of physics in

the Imperial University at Tokyo. His works include not only a memoir of 400 pages on the motions of the earth's atmosphere, but also an important paper on the movement of water in the soil, as affected by pressure, evaporation, capillarity, etc. This latter is undoubtedly the most extensive theoretical memoir ever yet published on the subject, and is accompanied by tables based on experiments, so that Kitao's results are applicable to all kinds of soils. As Kitao perfected his education in Germany, and was for a long time a pupil of Helmholtz, his scientific papers have been written in the German language and published among the memoirs of the university. It is very desirable that they should be reprinted and made easily accessible to scholars thruout the world. As such reprinting is done very cheaply in Japan, it is to be hoped that many will subscribe for early copies of the complete work.

Meteorologists will be especially pleased to learn that a reprint of all the works of Prof. William von Bezold has been undertaken by a German firm, and copies can be obtained thru any importer. As this reprint will include many memoirs additional to those contained in the Editor's "Mechanics of the Earth's Atmosphere", it should come into the hands of every student of the physics of the atmosphere.

American students frequently inquire for the memoirs published by Prof. William Ferrel. Some of these were reprinted in 1882 as Professional Paper No. 8 of the Signal Service. His popular essays form Professional Paper No. 12, and his "Temperature of the Atmosphere" was printed in 1884 as Professional Paper No. 13. His paper entitled "Recent Advances" was an appendix to the Annual Report of the Chief Signal Officer for 1885, and his papers on the reduction of the barometer to sea level and on the psychrometric formula were appendices to the Annual Report of the Chief Signal Officer for 1886. But these are only a small part of his works on meteorology; three most important contributions were published by the Coast Survey and others in scientific journals. It would give a great stimulus to the study of our science if all these could be reprinted in a style as handsome as that adopted by the Carnegie Institution in reprinting the works of Doctor Hill. Written by the founder of modern dynamic meteorology, even tho Ferrel's works be eventually superseded, yet they will always be classics and in great demand, and will reflect credit on America. But an expensive edition is to be avoided, as his writings should be made accessible to every student.

The editor has fortunately been able to preserve an excellent set of notes on a series of lectures delivered by Ferrel in 1885–6 to the higher officials of the Signal Service. These notes are a simple presentation of some of the more prominent points in meteorology that interested him, and are apparently worth elaborating and publishing in the style so often adopted by German students as tributes to the merits of eminent professors.—*C. A.*

PREMATURE PUBLICATION.

Investigators, busy in the search after new facts or laws in nature, have very different habits as to the publication of their results, depending, of course, upon their respective personal characters and experiences. Some, for instance, rush into print at every opportunity and keep the scientific world stirred up with the frequent announcement of interesting results, suggested possibilities, or half-proven novelties. Others are more circumspect, and are so reluctant to publish that which may be criticized or annulled by some fellow student along the same line of work, that the world very rarely hears from them. Euler published a thousand papers, but Helmholtz scarcely a hundred of a technical character. Now it is true that the thousands of authors and the tens of thousands of papers that are treasured in the history of science have not all of them been of the first class. Most of them may be said to be now utterly forgotten, and yet each did some little good; and there is no reason to regret that the world has had such men and has read their works. Each honest man studies, experiments, talks, writes, and teaches in the hope that he may accomplish something worth while, and each must be encouraged to do his best. The multiplicity of journals and societies may embarrass the bibliographer and overwhelm the reader who would keep up with the progress of knowledge, but it is better that authors should write and publishers print, rather than that nothing be done, as tho the world had gone to sleep. There must be a beginning, and the progress of knowledge will always relegate the poorest papers to obscurity. One valued correspondent, recently withdrawing an excellent paper that he had prepared for publication, writes:

> It is a poor plan to publish uncertainties and thereby perhaps befog the truth for years, as has happened ofttimes heretofore. Now the matter of the earth's radiation to space involves so many doubtful quantities that I believe the less a man commits himself in print until some more experiments are made, the better he will like it hereafter.

We fully agree with our correspondent that the action of the earth's atmosphere on the radiation that comes to us from the sun, and on that which goes from us outward into space, is a matter that still needs elucidation, and we shall be very glad to print whatever he has to say on the subject No man can write on this better than he, and his errors, if any, will not befog, but clear away the fogs of error. On the other hand the subject has so many different aspects that one man can scarcely compass them all, and we therefore hope that other eminent physicists, with all the resources of modern laboratories, will take up some aspects of atmospheric and terrestrial radiation, since it is a fundamental problem of meteorology. In a general way we understand that Langley, Abbot, and others have been able to demonstrate that the moist atmosphere exerts both a general absorption of all solar rays, and a special absorption of specific wave lengths. We may summarize this by saying that as to general absorption by the air all the shortest waves are wholly absorbed, the visual waves are partly absorbed, and the longer waves are slightly absorbed, except in the regions of special total absorption by water vapor, ammonia, carbonic acid, and other vapors, which regions, however, grow more and more extensive and profound as the wave length increases. We presume that by analogy we may also infer that the long wave radiation from the earth's surface is well-nigh extinguished by its absorption by the water vapor of the atmosphere, so that the radiation to space from the earth as a planet takes place almost wholly from the upper strata of its water-bearing atmosphere.

The preceding paragraph seems to be almost equivalent to the following statement by Abbot, who says that the idea that the earth's atmosphere is transparent to long wave lengths—

> Is certainly contrary to fact, as shown by the bolographs of the solar spectrum, which exhibit no energy to speak of in the water vapor bands; and also by the work of Rubens and Aschkinas, who show that much less water vapor than is present in the atmosphere is enough to completely absorb nearly all the range of wave lengths which the earth emits. This strong absorption of the earth's radiation must keep its surface warmer and more uniform in temperature than it would be otherwise, for the water equivalent of the atmosphere is not inconsiderable, and it must take some time to warm it by the absorption of the earth's radiation, and any covering that checks the escape of the heat must augment the temperature of what it covers. Hence I do not agree that the "outcome is the same in a general way", and I feel sure that the atmosphere is not transparent to long wave lengths.

These statements harmonize in a general way with most of the thermal phenomena; and yet they are but broad generalities when contrasted with all that we wish to know about terrestrial radiation. Much greater precision must be given to our ideas before we shall be able to explain or predict the formation of frost, cloud, hail, and the phenomena of storms from a mechanical point of view. The thermal phenomena of the atmosphere can be elucidated only by combined experi-

mental and mathematical work. They belong to the domain of mathematical physics. It is scarcely creditable to the laboratories and graduate students of American universities that many of them do not devote themselves to the study of problems in physics that have such important applications to meteorology. We believe that both the Astrophysical Observatory of the Smithsonian Institution and the Solar Physics Observatory of the Carnegie Institution, on Mount Wilson, will do much to elucidate our problems, but the field is broad enough for many other coworkers, some of whom must seek for stations in the thinnest, driest, clearest air that is attainable anywhere on the globe.—*C. A.*

SONORA STORMS AND SONORA CLOUDS OF CALIFORNIA.

By ARCHIBALD CAMPBELL. Dated Campo, Cal., September 17, 1906.

As to the "sonoras," or sonora clouds, as they are generally called on the Pacific coast (see fig. 1), I can only explain them thus: They were, I believe, so named by the old Spanish or Indian settlers of the high Sierras of Lower California, who from their elevated positions, 5000 to 7000 feet above sea level, looking across the narrow Gulf of California, could see these masses of clouds form, seemingly in the state of Sonora, Mexico, and rising as if from the plains of Sonora, in a few hours drench them with floods of rain.

FIG. 1.—Sonora cloud.

The belt on which these storms fall is from twenty to forty miles in width, east to west, and the length from north to south in Lower California is 450 miles, and in the United States 120 miles, mostly in San Diego County, but a small part in Riverside County, California, extending over the Laguna, Cuyamaca, and Palomar mountain ranges, southeast to northwest, ending at the north end of the Palomar Mountains, in Riverside County, and in the high backbone of the mountain range between the Imperial Desert and the coast. The conditions go no farther west than the 2000-foot elevation of this latter mountain chain, the backbone and source of all our San Diego County rivers. If we in southern California had the naming of the Sonoras, looking at them from our more northerly mountain tops, we might have called them the Arizonas, as to us they seemingly rise there. Very seldom does this cloud formation extend into the low belt of the coast, nor to the east into the desert, but occasionally, to the surprise of the inhabitants there, it does take a daring sweep out of its usual confines and give them a waking up from their sleep with lightning, thunder, and rain. The oval area covered by the sonoras is about the wettest spot on the Pacific coast, with sometimes an annual rainfall of fifty to sixty inches at Cuyamaca and Laguna. Here at Campo the United States Signal Officer caught and measured one of the downfalls, recording 16.10 inches of rainfall in August, 1890, in a few hours of one day. Some call these rains the tail end of the tropical showers. The first indications we have of the periodical coming of these storms in early July are low, white, flat banks of clouds in the southeast, which in a day or two form into castellated clouds and break into thunder, lightning, and rain. Often till near noon the sky is clear of clouds, then perhaps in an hour or so the sky is clouded all over with tremendous masses of solid-caverned thunderheads, which break in a short time into tremendous volumes of rain and

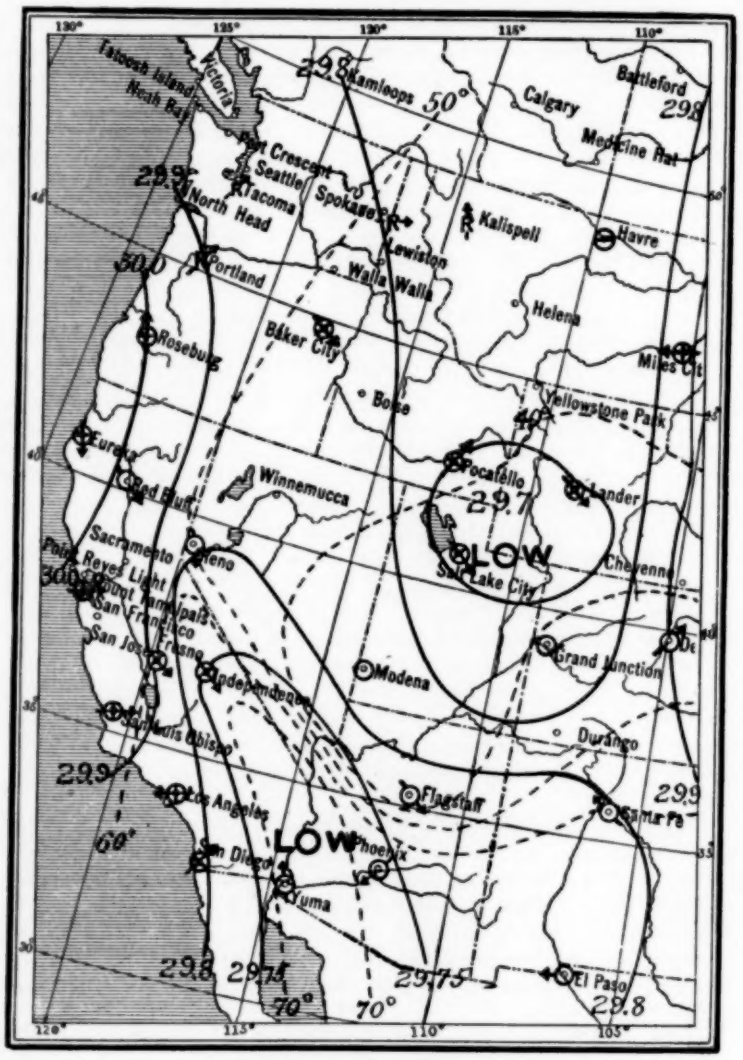

FIG. 2.—Weather map showing conditions which usually prevail during Sonora cloud period.

often destructive hailstorms. Sometimes for weeks at a time the whole belt, over 500 miles long, experiences unceasing thunder and lightning, and rain in partial areas. Sometimes these storms make a complete circuit of the horizon, commencing in the east and southeast with massive clouds, snow-white to dark gray, with tremendous up-sweeping clouds; then comes a rapid cannonade of thunder, with the most brilliant lightning ever seen; then the clouds rapidly move from their first base to south, southwest, and west, and so on in rapid succession till they make a complete circuit; but now and again they break off like a meteor into space and take a rapid straight course to the west or northwest toward the coast, so that for fifty to sixty miles one can follow them by the ever

decreasing thunder and the display of distant lightning. But in the center of this commotion we often get terrific thunder, lightning, and rain, shaking our houses like an earthquake. Last week three head of cattle were killed here by lightning, and on the very high mountain valleys amongst the tall timber many pine trees are ruined every year by lightning. The season of these storms lasts from July to early in October. The weather conditions during the three months of their duration are about as on the accompanying weather map (fig. 2) in the southwest corner "low." At its commencement the weather forecaster usually says of this low: "The usual summer conditions prevail in the southwest," or words to that effect. The only reports to the Weather Bureau of rainfall from this section are from Campo, Cuyamaca, and Nellie. For a number of years I reported for Laguna, but the frosts burst three rain gages for me. During the building of Moreno dam, reports were received from that place.

THE SANTA ANNA OR DESERT WINDS.

While I was writing the preceding lines another of our California climatic visitants with a Mexican name commenced on the 16th instant, the "Santa Anna", so called from the town of Santa Anna, near Los Angeles, where they blow with great violence and with volumes of dust so as to obscure the sky while they last. They are northers or "norther winds" there, and also in the big San Joaquin Valley of upper California. I was once lost there for three days, in one of them, and probably was not more than three miles from home all the time. In San Diego County we call them desert, or east winds; they come to us straight from the east, while in the desert they are west winds. They blow during periods of three to six or nine days, but rarely last beyond twenty-one days. They are cool winds to us here on the mountains, while on the coast they are hot, and are skin-drying, lip-cracking, unpleasant visitants. After they reach the coast the force is mostly out of them. Sometimes their force at Campo rivals a hurricane. In places they pierce window panes with little round holes as if drilled by the coarse gravel they carry like a dose of small shot. On my ranch on the Laguna Mountains, at an elevation of 6500 feet, all the east side is in big pine and oak timber for some miles; yet on the last ridge, overlooking the desert on the east, not a tree grows for miles, altho north and south they grow up to within 200 yards of it all along. Even the brush changes on that last ridge from a growth of six to ten feet down to all dwarf, creeping and clinging close to the ground, but of the same varieties as the upright. These winds are so violent that they often tear down houses. Their duration is from October to March. We generally get our first fall rains after the blow is over, but this year the first rain, on the 15th, preceded this one. If they come in the spring after the fruit blooms or forms, both the bloom and the young fruit drop off the trees after a short time. The barometer responds more quickly to an east wind than to any other change of weather.

HAS THE GULF STREAM ANY INFLUENCE ON THE WEATHER OF NEW YORK CITY?[1]

SIR: Your letter of September 14, requesting information as to supposed variations in the course of the Gulf Stream, and the possibility of the variations acting as a controlling factor in the climate of the city of New York, has been received.

The Bureau is in almost daily receipt of inquiries of this and a similar nature, all having their origin in a misconception of the character and extent of that motion of the ocean waters to which the name Gulf Stream may properly be applied. Speaking with precision, the term should be limited to that continuous discharge of the water of the Caribbean Sea and the Gulf of Mexico which takes place thru the Straits of Florida, a narrow outlet bounded on its western side by the State of the same name, and on its eastern by Cuba and the Bahama Islands and Bank. Thru this channel, constricted in its narrowest portion to a width of 32 miles, there is a constant outflow of the warm, equatorial waters heaped up in this vast and almost landlocked basin by the persistent action of the trade winds, rising at times in mid-stream to a velocity of four or five knots, and having a constant temperature of 81° or 82° F. The impetus imparted to this water by the pressure from the rear is moreover sufficient to maintain it in motion for a considerable distance beyond the actual point of exit from the channel proper, which may be considered as terminating at Matanilla Shoal, the northern extremity of the Great Bahama Bank, in latitude 27° north. As a result the stream continues to be felt as a distinct body of warm water about forty or fifty miles in width, moving steadily onward, but with uniformly diminishing velocity and temperature, until a point opposite Cape Hatteras is attained, or even opposite the Capes of the Chesapeake. Beyond this point, however, the warm current spreads out over the adjacent area of the ocean like a vast fan, and the identity of the stream is consequently obliterated in the general eastward drift which characterizes the waters of the temperate latitudes.

Speaking then with precision, the Gulf Stream is a current of warm water, forty or fifty miles in width, which emerges from the Straits of Florida, follows the coast of the United States northward as far as the Capes of the Chesapeake, and is there merged in the generally eastward drift underlying the prevailing westerly winds of the temperate latitudes. To describe it in the language of Maury as "a river in the ocean, having its fountain in the Gulf of Mexico, and its mouth in the Arctic Seas" is picturesque, but highly exaggerated and erroneous.

With reference to movements of the stream (viz changes in its location as a whole), reports of which, furnished by navigators, appear from time to time in the daily newspapers, it may be said that these probably do exist, altho within narrow limits. Observations of the "set" experienced by vessels crossing the stream, as also of the warmth of the surface waters, show that the position of the axis, or line of greatest velocity, as also that of the line of maximum temperature, may vary from day to day over a range of fifty miles. The methods of observations employed are, however, so replete with sources of error that little confidence can be placed in any single result. That such movements can have any effect upon the climate in the vicinity of New York is highly improbable, the stream itself in these latitudes being so dispersed as to be almost indefinable, and the modifications of the surface temperatures of the adjacent waters wrought by a temporary change in its position being certainly negligible.—*J. P.*

[1] The above letter, by Mr. James Page, was sent in reply to a gentleman who had been told that a mild winter in New York city was due to the fact that the Gulf Stream is running 60 miles nearer shore than previously. We hope that its publication may contribute to correct the numerous popular misapprehensions relative to the important part played by the Gulf Stream in the economy of nature.—EDITOR.

ON THE FORMATION OF ANCHOR ICE, OR GROUND ICE, AT THE BOTTOM OF RUNNING WATER.

By H. T. BARNES, D. Sc., Associate Professor of Physics, McGill University, Montreal.
Dated December 4, 1906.

A recent paper[1] on ground ice, by M. J. de Schokalsky, calls attention to the formation of ice at the bottom of Lake Ladoga, near St. Petersburg, and a general description of the ice was given. No suggestions were made, however, as to the cause of the phenomenon, and it was stated that beyond the important report of M. F. Wladimiropp[2], little attention had been directed to the study of it. For the past ten years the writer has been observing, from time to time, the same

[1] Comptes Rendus, vol 143, p. 261 (1906). Science Abstracts, vol. 9, p. 455 (1906).
[2] Water Works Commission, St. Petersburg (1904).

thing in Canadian waters, where the severity of the climate in winter brings about the growth of immense masses of ground ice. In America the ice goes by the name of anchor ice from its being attached or anchored to the bottom, and has been so called since 1830. It has been observed in all countries where river ice is formed and has been called "ground ice", "bottom ice", "ground gru", a name given it by the inhabitants of Aberdeenshire, "lappered ice", by the common people of south Scotland, "glace de fond", by the French, and "Grund eis", by the Germans. The French-Canadian expression is "moutonne", from its resemblance to the white backs of sheep at rest. The phenomenon of ice forming on the bottom of rivers has been known for a very long time, and altho the majority of the early philosophers of France denied its existence it was perfectly well known to every peasant.

In 1788 M. Beaun wrote several papers to establish the existence of ground ice from his personal observations. He reports that the fishermen on the Elbe used to find the baskets which they let down into the river for the purpose of catching eels, when brought up to the surface, often incrusted with ice. Anchors used for mooring their boats, when lost during the summer, frequently appeared in the following winter, being raised by the mass of ice which had formed about them. Their signal buoys sometimes became displaced from the raising of the large stones by the ground ice and caused great inconvenience.

M. Desmarest, a member of the French Academy of Sciences, was among the first of the scientists to make observations on the formation of ground ice. He reports having observed flakes of ice formed at the bottom of running streams increase in thickness five or six inches in a single night. In Ireland's Picturesque Views of the River Thames, published in 1792, the ground ice of that river is mentioned. It is stated: "The water men frequently meet the ice meers, or cakes of ice, in their rise, and sometimes in the underside inclosing stones and gravel brought up by them *ab imo*".

In February of 1827, M. Hugi, President of the Society of Natural History at Soleure, reports that while standing on the bridge over the Aar, when the river was clear of ice, he observed large ice tables continually rising from the bottom, in a vertical direction and with such buoyancy as to rise considerably above the surface, when they immediately sank into a horizontal position and floated down stream.

In 1833 the eminent philosopher, M. Arago, published an interesting paper on the subject in the Annuaire du Bureau des Longitudes for that year[3]. He mentions the following rivers where ground ice is met with and the date of such observation: in the Thames, by Hales, in 1730; in the River Déonie, France, in 1780; in the Elbe, by Beaun, in 1788; in the Teine, Herefordshire, in 1816; in the Rhine, at Strasburg, in 1829; and in the Seine, in 1830.

In the Edinburgh New Philosophical Journal for 1834[4] there is an interesting paper on "Observations on ground ice", by the Rev. Mr. Eisdale, who attempts to explain the phenomenon on an original theory of his own. He states that the ice commences on the bottom and extends upward to the surface, and is produced only in the most rapid and most rugged streams.

The Rev. Dr. Farquharson published two important papers on "Ground gru" in the Philosophical Transactions of 1835 and 1841[5]. His observations were made of the ice in the rivers Don and Leochal, in Aberdeenshire. The conclusions he arrived at are that ground gru is formed by radiation, and he gives a large number of observations, which clearly show this to be the case for the examples which came under his notice.

As early as 1810 writers of that time drew a distinction between three kinds of river ice, if we may judge from an early edition of the Encyclopedia Britannica published at that date. Under the article on ice we find the following:

> Ice forms generally on the surface of the water, but this too, like the crystallization, may be varied by an alteration in the circumstances. In Germany, particularly the northern parts of the country, it has been observed that there are three kinds of ice. 1. That which forms on the surface. 2. Another kind formed in the middle of the water, resembling nuclei or small hail. 3. Ground ice, which is produced at the bottom, especially where there is any fibrous substance to which it may adhere. This is full of cells like a wasp's nest, but less regular, and performs many strange effects in bringing up very heavy bodies from the bottom by means of its inferiority in specific gravity to the water in which it is formed. The ice which forms in the middle of the water rises to the top and then unites in large masses, but the formation both of this and the ground ice takes place only in violent and sudden colds, where the water is shallow and the surface is disturbed in such a manner that the congelation can not take place. The ground ice is very destructive to dykes and other aquatic works. In the more temperate European climates these kinds of ice are not met with.

In Canada three kinds of ice are observed, similar to those just described. These go by the name of sheet or surface ice, anchor ice, and frazil ice. The latter corresponds to what the early writer in the Encyclopedia Britannica states is formed in the middle of the water.

Frazil is the French Canadian expression for spicular ice, meaning cinder ice. It is formed in all rivers or streams flowing too swiftly for surface ice to form, and is produced in such immense quantities in Canadian rivers as to cause, in many cases, serious obstacles to hydraulic development. Anchor ice forms in situ on the bed of a river and often attains a thickness of five or six feet. It has never been observed in Canada to form under a layer of surface ice, because usually such ice is covered by an opaque layer of snow, which acts as an effective check to the radiation of heat from the bottom of a river, which appears to be the real cause of its formation. The writer[6] has measured the temperature of the water in winter both under the surface ice in the St. Lawrence River, opposite Montreal, and in the open water of the Lachine Rapids, when ice was forming rapidly. It was found that the water in this condition becomes slightly undercooled to the order of a few thousandths of a degree, and that the ice which is formed is in a very adhesive state. On the cessation of cold weather the temperature of the water rises slightly above the freezing point and the ice gradually melts. Anchor ice rises from the bottom in mild weather, and also in extreme cold weather under the influence of a bright sun, which has the power to melt it off from the rocks to which it is attached.

The formation of ice[7] has been shown to be accompanied by a small temperature depression in the water, and even in the most severe weather the undercooling is less than a hundredth of a degree centigrade. This fact is already made use of in water powers, where a little steam heat, applied around the wheel gates or directly in the wheel cases of the turbines, warms the surface of the metal sufficiently to prevent the adhesion of the frazil ice crystals. Electric heating is also being applied with some success, and it is safe to say that before long no bad effects from the presence of ice in the water need be feared.

The influence of the sun is everywhere observed in the formation of both frazil and anchor ice—in the former by warming the water and preventing it from becoming undercooled, and in the latter by loosening the masses of anchor ice and causing them to rise. Frazil ice is never observed to possess adhesiveness under a strong sun.

A common sight in the early morning after a cold, clear night, when the sun rises, is the appearance of masses of anchor ice. These rise and float down with the current in great quantity. Boatmen are very careful when crossing a river never to go when these masses are rising, from the

[3] Also, Edinburgh New Philosophical Journal, vol. 15, p. 123 (1833).
[4] Vol. 17, p. 167 (1834).
[5] Vol. 125, p. 329 (1835); vol. p. 131, 37 (1841).
[6] Trans. Roy. Soc. Can. New Series, vol. 2, p. 37 (1896); vol. 3, p. 17 (1897).
[7] Ice Formation, p. 175. New York: John Wiley & Sons, 1906.

danger of being surrounded and caught in a mass of anchor ice, and carried down helpless by the stream into the rapids.

The growth of anchor ice is exceedingly beautiful, taking place in arborescent forms resembling bushy weeds. So hard and thick does it become that it is often very difficult to thrust a sounding rod thru it. It is very granular in structure, as is shown by an examination of the masses that rise to the surface. Thru clear water the ice looks weed-like, with long tentacles rising up out of the mass. It often has immense power in lifting rocks and boulders bodily up, and many of these are carried far down stream, attached to irregular masses of ice. The spongy character of adhering frazil crystals and anchor ice causes them to accumulate slime and infusorial growths from the water, imparting a general brown color to the masses.

If the various facts of common observation in connection with anchor ice be considered, it will be seen that everything points to radiation as the prime cause for its formation. Thus, a bridge or cover prevents the forming of ice underneath. Such a cover acts as a check to radiation, and reflects the heat waves back again to the bottom. Anchor ice rarely grows under a layer of surface ice unless this is clear. It forms on dark rocks more readily than on light ones, which is in accord with what we know in regard to the more copious radiation of heat from dark surfaces. Anchor ice rarely forms under a cloudy sky, either by day or night, no matter how severe the weather, but it forms very rapidly under a clear sky at night. Anchor ice is readily melted off under a bright sun. It seems highly probable then that radiation of heat supplies the necessary cooling to the bottom of a river to form the first layers of ice, after which the growth or building up of the ice is aided by the entangling and freezing of frazil crystals always present in the water. This applies, of course, only to water flowing too swiftly for surface ice to form. The formation of a surface sheet below a stretch of open water or rapids serves to collect immense masses of the fine frazil ice.

Frequently serious damming of the water occurs by the complete stoppage of the channels under the ice. This brings about a rise of water level until sufficient weight has accumulated to enable the water to drive the barrier before it and force a channel for itself. Floods occur as a result of these winter shoves, and frequently occasion considerable damage to property along the river side. The fine frazil ice reaches great depths in many parts of the St. Lawrence River near Montreal, where it is carried under the surface ice by the swift currents of the rapids. Accumulations 80 feet deep, extending from the surface ice to the bottom of the river, were recorded by the members of the Montreal Flood Commission in 1888.

The depth of formation of anchor ice appears to be from forty to forty-five feet in the fresh waters of the Canadian rivers. Along the coast of Newfoundland it has been observed to form as deep as 70 feet in the clearer salt water. The temperature of the water on the bottom need not be exactly at the freezing point for anchor ice to form, the cooling of the bottom by radiation being sufficient to bring it to the freezing point, notwithstanding the slow conduction of heat from the earth.

WEATHER BUREAU MEN AS EDUCATORS.

The following lectures and addresses by Weather Bureau men are reported:

Mr. J. Cecil Alter, May 25, 1906, before the Monday Night Literary Club of Salt Lake City, Utah; also October 23, 1906, before the convention of the Utah Federation of Women's Clubs, at Park City, Utah, on "Some Inside Information on the Weather Outside", illustrated with large hand-made drawings.

Mr. H. W. Richardson, October 4, 1906, before pupils and teachers of the Blaine High School, Superior, Wis., on "The United States Weather Bureau and its Work".

Mr. J. Warren Smith, October 20, 1906, before the Engineer's Club of Columbus, Ohio, on "The Work of the Weather Bureau", illustrated.

Mr. P. H. Smyth, October 27, 1906, before the Farmers' and Teachers' Institute, Olive Branch, Ill., on "Value and Utility of United States Weather Bureau Forecasts and Warnings".

Mr. F. T. Williams, October 26, 1906, before the Church Club, of St. Paul, Minn., on "The Weather Bureau and its Work".

Mr. L. H. Daingerfield, November 19, 1906, before the physiography class of the Centennial High School, Pueblo, Colo., on "The Work of the United States Weather Bureau".

Classes from schools and academies and parties of teachers have visited Weather Bureau offices, to study the instruments and equipment and receive informal instruction, as reported from the following offices:

Boise, Idaho, August 4 and 9, 1906, students from the joint Summer School and Teachers' Institute for southwestern Idaho; also October 27, the physical geography class from the Cole School.

Buffalo, N. Y., October 13, 1906, members of Junior Division No. 2, Boys' Department of the local Young Men's Christian Association.

Cairo, Ill., September 5, 1906, a party of teachers from the Alexander County Teachers' Institute.

Columbus, Ohio, October 23, 1906, a class of special students from the South High School.

Duluth, Minn., September 13, 1906, about thirty-five students of the Freshman class, Duluth State Normal School.

Indianapolis, Ind., October 10, 15, and 17, 1906, the physical geography classes of the Shortridge High School.

Oklahoma, Okla., October 22, 1906, the physical geography class of the Epworth University Academy.

Salt Lake City, Utah, during the school year 1905–6, about five hundred students from the Latter Day Saints' College, the city graded and high schools, the University of Utah, and the district schools of near-by towns.

RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

H. H. KIMBALL, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

Associacion de Ingenieros y Arquitectos de Mexico.
Anales. Tomo 13. Mexico. 1905. 310 pp. 8°.

Bastin, S. Leonard.
The effects of civilization upon climate. (Monthly review, London. v. 24, September, 1906. Pp. 116–124.)

Beach, Harlan P[age].
A geography and atlas of Protestant missions. 2 vols. viii, 571; 54 pp. 18 pl.

Belgium. Observatoire Royal de Belgique.
Annuaire météorologique. 1905. Bruxelles. 1905. vii, 704 pp. 24°.
Same. 1906. Bruxelles. 1906. vii, 599 pp. 24°.

Bolivia. Ministerio de Colonizacion y Agricultura.
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H. H. KIMBALL, Librarian.

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STUDIES ON THE THERMODYNAMICS OF THE ATMOSPHERE.

By Prof. FRANK H. BIGELOW.

VIII.—THE METEOROLOGICAL CONDITIONS ASSOCIATED WITH THE COTTAGE CITY WATERSPOUT—Continued.

RELATIONS BETWEEN WIND VELOCITIES AND ATMOSPHERIC PRESSURES.

In meteorology there are various relations depending on the influence of wind velocities upon pressure, which must be considered in addition to the usual static barometric pressure used in the construction of synoptic weather maps, and in the determination of heights. Those reductions assume that the air is calm, and that the difference of pressure depending on wind velocity may be neglected. On the other hand, in tornadoes, waterspouts, hurricanes, and strongly developed cyclones the velocity of the wind gives rise to variations of pressure from point to point. In theoretical meteorology, and in the practical calculation of the effects of high winds upon buildings and other structures, as when a tornado passes over a city or thru a forest, it is very important to have a definite knowledge of the relations between these two phenomena. The literature of this subject is very extensive, but an attempt will be made to bring together in suitable form for reference the facts likely to be of value to meteorologists, engineers, and architects.

FORMULAS FOR WIND VELOCITIES AND PRESSURE GRADIENTS.

Table 52, formulas 1–13, contains the development of the velocity-pressure function from the primary equation (203), page 505, Cloud Report, Vol. II, 1898–1899. By means of the auxiliaries on the side of the table the final equation 13 is found,

$$q = 23.96\sqrt{\frac{T}{B}\Delta B}\,.$$

TABLE 52.—*Formulas for wind velocities and pressure gradients.*

		Auxiliaries.
(1)	$-\frac{\partial P}{\rho} = u\partial u + v\partial v + w\partial w + g\partial z.$	$\frac{1}{\rho} = \frac{1}{\rho_0}\frac{P_0}{P}\frac{T}{T_0}.$
(2)	$-\frac{\partial P}{P}\frac{P_0}{\rho_0}\frac{T}{T_0} = u\partial u + v\partial v + w\partial w + g\partial z.$	$P_0 = g_0 p_0 = g_0 \rho_m B_n.$
(3)	$-\frac{\partial P}{P} = -\frac{\partial p}{p} = \frac{\rho_0}{P_0}\frac{T_0}{T}(u\partial u + v\partial v + w\partial w + g\partial z).$	$P_0 = g_0 \rho_0 l.$
(4)	$= \frac{1}{g_0 l}\frac{T_0}{T}(u\partial u + v\partial v + w\partial w + g\partial z).$	$\frac{\partial P}{P} = \frac{\partial p}{p} = \frac{\partial B}{B}.$
		$\rho_m = 13595.8$ kilograms. $\rho_0 = 1.29305$ kilograms. $l = 7991.04$ meters. $g_0 = 9.806$ meters.
(5)	$\log p_0 - \log p = \frac{1}{g_0 l}\frac{T_0}{T}\left[\frac{1}{2}(q^2 - q_0^2) + g(z - z_0)\right]$	
(6)	$\log_n p_0 - \log_n p = \frac{1}{156718}\frac{T_0}{T}\left(q^2 - q_0^2\right) + \frac{1}{7991.04}\frac{g}{g_0}\frac{T_0}{T}(z - z_0)$	Natural logarithms.
(7)	$\log p_0 - \log p = \frac{1}{360\,858}\frac{T_0}{T}(q^2 - q_0^2) + \frac{1}{18400}\frac{g}{g_0}\frac{T_0}{T}(z - z_0)\,.$	Common logarithms.

Integrate the velocity term alone when the gravity term is omitted.

(8)	$\int\frac{-\partial B}{B} = \int\frac{1}{g_0 l}\frac{T_0}{T}q\partial q$	Take $-\int\frac{\partial B}{B} = -B\int\partial B.$
(9)	$-(B - B_0) = \frac{B}{g_0 l}\frac{T_0}{T}\frac{1}{2}(q^2 - q_0^2).$	
(10)	$\Delta B = B_0 - B = \frac{T_0}{2 g_0 l}\frac{B}{T}(q^2 - q_0^2)\,.$	$\frac{T_0}{2 g_0 l} = 0.001742.$
(11)	$\Delta B = 0.001742\frac{B}{T}q^2.$	For $q_0 = 0.$
(12)	$q^2 = 574.06\frac{T}{B}\Delta B.$	
(13)	$q = 23.06\sqrt{\frac{T}{B}\Delta B}.$	B and ΔB in meters. q = velocity in meters per second.

TABLE 53.—*Barometric gradient sustaining an eastward velocity only.*

			Auxiliaries.
(14)	Standard.	$\Delta B = \frac{D}{10514.5}\frac{1}{g_0}2n v\sin\varphi = 0.1572 v\sin\varphi.$	$D = 111\,111\,000$ in millimeters. $g_0 = 9.806$ meters.
(15)	Other density.	$\Delta B = 0.1572\frac{B}{760}\frac{273}{T}v\sin\varphi.$	$2n = 0.000\,1458.$
		$= \frac{1}{17.72}\frac{B}{T}v\sin\varphi = 0.05646\frac{B}{T}v\sin\varphi.$	B in millimeters. v in meters per second.

TABLE 54.—*The Newtonian theorem.*

		Auxiliaries.
		Take $u=v=0$. $P=gp$. $z=h$.
(1)	$-\frac{\partial P}{\rho} = u\partial u + v\partial v + w\partial w + g\partial z.$	
(16)	$-g\frac{\partial p}{\rho} = w\partial w + g\partial h.$	
(17)	$-\partial p = \frac{\rho}{g} w\partial w + \rho\frac{g}{g}\partial h.$	By integration.
(18)	$p_0 - p = \rho\frac{1}{2g}(w^2 - w_0^2) + \rho(h - h_0).$	When falling from rest $h_0=0$. $w_0=0$. $p_0=0$.
(19)	$-p = \rho\frac{1}{2g}w^2 + \rho h.$	
(20)	$w^2 = 2gh.$	Law of a freely falling body for $p=0$.
(21)	$p_x = \rho\frac{w^2}{2g}A.$	Newtonian theorem. For area A.

TABLE 55.—*The vertical velocity that just sustains a freely falling body.*

Units. Meter–kilogram–second. (M. K. S.)

		Notation.
(22) General formula.	$\Delta B = \frac{1}{574.06}\frac{B}{T}w^2.$	w in meters per second.
(23) Pressure	$\Delta p_A = \Delta B\,\sigma_m A = \frac{13595.8}{574.06}\frac{B}{T}w^2 A\ \frac{\text{kilogram}}{m^2}$	A = surface.
	$= 23.68\frac{B}{T}w^2 A.$	$\sigma = 1000\rho$ kilograms.
	$= 0.08675\,B\frac{T_0}{T}w^2 A.$	$\sigma_m = 13595.8$.
	$= 0.065936\frac{B}{B_0}\frac{T_0}{T}w^2 A.$	r, D in meters.
		B, ΔB in meters.

The equivalent normal surface for a sphere $= A = \frac{1}{2}\pi r^2 = \frac{1}{2}\pi\frac{D^2}{4}$. The velocity must be increased by some factor k, as determined by experiments, to allow for the action of the body in modifying the stream lines of pressure. *Ferrel* assumes $k = 1.104$; *Schreiber*, $k = 1.3$.

		($k=1.00$.)	Ferrel(k 1.104.)	Schreiber ($k=1.30$.)
(24) Pressure	$\Delta p_A = \Delta B\,\sigma_m\frac{1}{2}\pi r^2 = 37.200\frac{B}{T}r^2w^2k.$		41.07	48.36
	$= 9.300\frac{B}{T}D^2w^2k.$		10.[illegible]7	12.09
	$= 0.10356\frac{B}{B_0}\frac{T_0}{T}r^2w^2k.$		0.11436	0.13464
	$= 0.02589\frac{B}{B_0}\frac{T_0}{T}D^2w^2k.$		0.02859	0.03366

The weight of the body to be just sustained, σ = specific weight.

(25) Weight	$W_g = \frac{4}{3}\pi r^3\rho \times 1000$ kilograms $= 4188.8\,r^3\rho = 4188.8\,r^3\frac{\rho_w}{\rho_1}$	
	$= \frac{4}{3}\pi\frac{D^3}{8}\rho \times 1000$ kilograms $= 523.6\,D^3\rho = 523.6\,D^3\frac{\rho_w}{\rho_1}$	
(26) Specific weight	$\frac{\rho_w}{\rho_1} = \frac{\text{specific weight of body}}{\text{specific weight of water}} = \rho_w.$	
(27)	$\frac{\rho}{\rho_0} = \frac{\text{density of air above surface}}{\text{density of air at surface}} = \frac{B}{B_0}\frac{T_0}{T}.$	
(28) For equilibrium	$\Delta p_A = W_g = 37.200\frac{B}{T}r^2.\ w^2.k = 4188.8\,r^3.\ \rho_w.$	
(29)	$= 9.300\frac{B}{T}D^2.w^2.k = 523.6\,D^3.\rho_w.$	
(30)	$= 0.10356\frac{B_0}{B}\frac{T_0}{T}r^2.\ w^2.k = 4188\ 8\,r^3.\ \rho_w.$	
(31)	$= 0.02589\frac{B}{B_0}\frac{T_0}{T}D^2.w^2.k = 523.6\,D^3.\rho_w.$	

TABLE 56.—*Velocities.*

			Logs.
(32)	$w^2 = \frac{4188.8}{37.20}\frac{T}{B}\frac{r\rho_w}{k}$.	$w = 10.610\sqrt{\frac{T}{B}\,r\,\rho_w\frac{1}{k}}$	[1.02578].
(33)	$w^2 = \frac{523.6}{9.300}\frac{T}{B}\frac{D\rho_w}{k}$.	$w = 7.503\sqrt{\frac{T}{B}D\,\rho_w\frac{1}{k}}$	[0.87526].
(34)	$w^2 = \frac{4188.8}{0.10356}\frac{B_0}{B}\frac{T}{T_0}\frac{r\rho_w}{k}$.	$w = 201.12\sqrt{\frac{B_0}{B}\frac{T}{T_0}\,r\,\rho_w\frac{1}{k}}$	[2.30345].
(35)	$w^2 = \frac{523.6}{0.02589}\frac{B_0}{B}\frac{T}{T_0}\frac{D\rho_w}{k}$.	$w = 142.21\sqrt{\frac{B_0}{B}\frac{T}{T_0}D\,\rho_w\frac{1}{k}}$	[2.15294].

Units. Centimeter–gram–second. (C. G. S.)

Taking B, r, and D in centimeters, ρ_w in grams, the velocities then become,

(36) Velocity in meters per second. $$w = 10.610\sqrt{\frac{T}{B}\,r\,\rho_w\frac{1}{k}}.$$

(37) $$w = 7.503\sqrt{\frac{T}{B}D\,\rho_w\frac{1}{k}}.$$

(38) $$w = 20.112\sqrt{\frac{B_0}{B}\frac{T}{T_0}r\rho_w\frac{1}{k}} = 20.112\sqrt{r\frac{1}{k}\frac{\rho_0}{\rho}\rho_w}.$$

(39) $$w = 14.221\sqrt{\frac{B_0}{B}\frac{T}{T_0}D\,\rho_w\frac{1}{k}} = 14.221\sqrt{D\frac{1}{k}\frac{\rho_0}{\rho}\rho_w}.$$

Application of formula (37); w in meters per second.

$w = 7.503\sqrt{\frac{T}{B}}$						Rain $\rho_w = 1.$		Hail $\rho_w = 0.917.$		Friction factor.	
Height in meters.	B	T				D	$\sqrt{D}$	D	$\sqrt{D\rho_w}$	k	$\sqrt{\frac{1}{k}}$
		273	283	293	303	313							
	cm.	m. p. s.	m. p. s.	m. p. s.	m. p. s.	m. p. s.	cm.		cm.			
0	76.00	14.22	14.48	14.73	14.98	15.23	1.00	1.00	10	3.03	1.0	1.00
1000	67.51	15.09	15.36	15.63	15.90	16.16	0.90	0.95	9	2.87	1.1	0.95
							0.80	0.89	8	2.71	1.2	0.91
2000	60.25	16.01	16.30	16.58	16.87	17.14	0.70	0.84	7	2.53	1.3	0.88
							0.60	0.78	6	2.35	1.4	0.85
							0.50	0.71	5	2.14	1.5	0.82
3000	53.28	16.99	17.29	17.60	17.89	18.19	0.40	0.63	4	1.90	1.6	0.78
4000	47.34	18.02	18.35	18.67	18.98	19.29	0.30	0.55	3	1.66	1.7	0.77
							0.20	0.45	2	1.35	1.8	0.75
							0.10	0.32	1	0.96	1.9	0.73
5000	42.16	19.12	19.47	19.81	20.14	20.47	0.05	0.22				
							0.01	0.10				
							0.001	0.03				
6000	37.37	20.28	20.65	21.01	21.37	21.72						
7000	33.29	21.52	21.91	22.29	22.67	23.06						
8000	29.59	22.83	23.24	23.65	24.06	23.44						

TABLE 57.—*Conversion factors for units of length, mass, and pressure.*

Units.	Meter-kilogram-seconds.		Decimeter-gram-seconds.		Centimeter-gram-seconds.		Foot-pound-seconds.		Inch-grain-seconds.	
	Number.	Logarithm.	Number.	Logarithm.	Number.	Logarithm.	Number.	Logarithm.	Number.	Logarithm.
Length, L.	1 meter.	0.00000	10	1.00000	100	2.00000	3.2808	0.51599	39.37	1.59517
	0.1	9.00000	1 decimeter.	0.00000	10	1.00000	0.32808	9.51599	3.937	0.59517
	0.01	8.00000	0.1	9.00000	1 cm.	0.00000	0.032808	8.51599	0.3937	9.59517
	0.3048	9.48402	3.048	0.48402	30.48	1.48402	1 foot.	0.00000	12.0	1.07918
	0.0254	8.40484	0.254	9.40484	2.54	0.40484	0.08333	8.92082	1 inch.	0.00000
Mass, M.	1 kilogram.	0.00000	1000	3.00000	1000	3.00000	2.2046	0.34333	15432.4	4.18843
	0.001	7.00000	1 gram.	0.00000	1	0.00000	0.0022046	7.34333	15.4324	1.18843
	0.001	7.00000	1	0.00000	1 gram.	0.00000	0.0022046	7.34333	15.4324	1.18843
	0.453593	9.65667	453.593	2.65667	453.593	2.65667	1 pound.	0.00000	7000	3.84510
	0.00064799	5.81157	0.064799	8.81157	0.064799	8.81157	0.00014286	6.15490	1 grain.	0.00000
Pressure, $p = \frac{M}{L\,T^2}$	1 kilo./m.^{2}	0.00000	10	1.00000	0.1	9.00000	0.20481	9.31135	9.9562	0.99809
	0.1	9.00000	1 gram/dm.^{2}	0.00000	0.01	8.00000	0.020481	8.31135	0.99562	9.99809
	10	1.00000	100	2.00000	1 gram/cm.^{2}	0.00000	2.0481	0.31135	99.5620	1.99809
	4.8823	0.68863	48.823	1.68863	0.48823	9.68863	1 lb./ft.^{2}	0.00000	48.6110	1.68674
	0.10044	9.00189	1.0044	0.00189	0.010044	8.00189	0.020571	8.00000	1 gr./in.^{2}	0.00000

TABLE 58.—*Conversion factors for units of distance, time, and velocity.*

Units.	Meters per second.		Kilometers per second.		Miles per hour.		Feet per second.	
	Number.	Logarithm.	Number.	Logarithm.	Number.	Logarithm.	Number.	Logarithm.
Distance, S.	1 meter 1000. 1609.315 0.304794	0.00000 3.00000 3.20664 9.48400	0.001 1 kilometer. 1.609315 0.00030479	7.00000 0.00000 0.20664 6.48400	0.00062138 0.62138 1 mile. 0.0001894	6.79336 9.79336 0.00000 6.27737	3.2809 3280.9 5280. 1 foot.	0.51600 3.51600 3.72263 0.00000
Time, T.	1 second 3600 3600 1	0.00000 3.55630 3.55630 0.00000	0.0002778 1 hour. 1 0.0002778	6.44370 0.00000 0.00000 6.44370	0.0002778 1 1 hour. 0.0002778	6.44370 0.00000 0.00000 6.44370	1 3600 3600 1 second.	0.00000 3.55630 3.55630 0.00000
Velocity, $V=\frac{S}{T}$	1 m./sec. 0.2778 0.4470 0.3048	0.00000 9.44370 9.65034 9.48400	3.600 1 kilo./hour. 1.6093 1.0973	0.55630 0.00000 0.20664 0.04030	2.2369 0.6215 1 mile/hour. 0.6818	0.34966 9.79336 0.00000 9.83367	3.2809 0.9113 1.4666 1 ft./sec.	0.51600 9.95970 0.16633 0.00000

TABLE 59.—*Conversion factors for pressures and velocities.*

Pounds / foot².	Miles / hour.	Feet / second.	Meters / second.	Kilograms / hour.
$\Delta p =$	$1\ cv_1^2$	$= (0.6818)^2\ cv_2^2$	$= (2.2369)^2\ cv_3^2$	$= (0.6215)^2\ cv_4^2$
		0.4649	5.004	0.3861
		[9.66734] log	[0.69932] log	[9.58672] log
Kilogr. / met.².				
$\Delta p =$	$4.8823\ cv_1^2$	$= 4.882 \times (0.6818)^2\ cv_2^2$	$= 4.882\ (2.2369)^2\ cv_3^2$	$= 4.882\ (0.6215)^2\ cv_4^2$
		2.270	24.43	1.885
		[0.35597] log	[1.38795] log	[0.27535] log
Grams / cm.².				
$\Delta p =$	$4.8823 \times 0.1\ cv_1^2$	$= 0.4882\ (0.6818)^2\ cv_2^2$	$= 0.4882\ (2.2369)^2\ cv_3^2$	$= 0.4882\ (0.6215)^2\ cv_4^2$
		0.2270	2.443	0.1885
		[9.35597] log	[0.38795] log	[9.27535] log
Grains / inch².				
$\Delta p =$	$4.8823 \times 9.9562\ cv_1^2$	$= 48.61\ (0.6818)^2\ cv_2^2$	$= 48.61\ (2.2369)^2\ cv_3^2$	$= 48.61\ (0.6215)^2\ cv_4^2$
	48.61	22.60	243.3	1.877
	[1.68674] log	[1.35408] log	[2.38606] log	[0.27346] log
Grams / dm.².				
$\Delta p =$	$4.8823 \times 10\ cv_1^2$	$= 48.823\ (0.6818)^2\ cv_2^2$	$= 48.823\ (2.2369)^2\ cv_3^2$	$= 48.823\ (0.615)^2\ cv_4^2$
	48.823	22.697	244.32	18.852
	[1.68863] log	[1.35597] log	[2.38795] log	[1.27535] log

c represents the other terms in the general formula for Δp.

The numbers inclosed in brackets are logarithms of the factors accurately computed.

TABLE 60.—*Resistance to a solid moving in a fluid.*

Newton's theorem and the coefficient k.

ρ = density, h = height, w = vertical velocity, A = Area. The resistance between the solid and fluid is equal to the pressure due to the weight of a column of the fluid $\rho h A = p_N$, where $w^2 = 2gh$, and $h = \frac{w^2}{2g}$, so that $p_N = \rho \frac{w^2}{2g} \cdot A$ .....(21).

By observations this requires a coefficient $k = \frac{p_0}{p_N}$.

$$p_0 = \rho \frac{w^2}{2g} k \cdot A$$

On account of viscosity and other forces the more complete formula is $p = aw + bw^2 + cw^3 + \ldots$.

For air blowing against a plate normally there is an excess of pressure $+ \Delta p_1$ on the front side, and a defect of pressure $- \Delta p_2$ on the back side of the plate.

Take the static pressure of the air on the body $= p$.

(40) Front side pressure $= p_1 = p + \Delta p_1 = p + k_1 \rho \frac{w^2}{2g} A$

(41) Back side pressure $= p_2 = p - \Delta p_2 = p - k_2 \rho \frac{w^2}{2g} A$

(42) Wind pressure $= p_1 - p_2 = \Delta p = + \Delta p_1 + \Delta p_2$

$$= (k_1 + k_2) \rho \frac{w^2}{2g} A = k \cdot \rho \frac{w^2}{2g} A.$$

TABLE 61.—*Differential coefficients.*

From (23) $\Delta p = c \cdot k \frac{B}{T} w^2$. c = constant.

k = coefficient of resistance = 1.30.

(43) $\frac{100\, d\, \Delta p}{p} = \frac{100\, dk}{1.3} = 77\, dk$. Increase $\Delta k = +0.1$; increase $\Delta p = 7.7\,\%$.

(44) $= \frac{100}{760} d B = 0.13\, dB^{mm}$. Inc. $\Delta B = +1^{mm}$; increase $\Delta p = 0.13\,\%$.

(45) $= -\frac{100}{273} dT = -0.37\, dT$. Decrease $\Delta T = -1°$; increase $\Delta p = 0.37\,\%$.

(46) $\frac{100\, d\, \Delta p}{p} = \frac{c \frac{B}{T} w^2\, dk \cdot 100}{c \frac{B}{T} w^2 1.3} = \frac{100\, dk}{1.3}$.

$$= \frac{ck\frac{1}{T}w^2 dB \times 100}{ck\frac{760}{T}w^2} = \frac{100\,dB}{760}. \tag{47}$$

$$= -\frac{ck\frac{B}{T^2}w^2 dT 100}{ck\frac{B}{T}w^2} = -\frac{100\,dT}{273}. \tag{48}$$

From (23) $w^2 = \Delta p \frac{T}{B}\frac{1}{c.k}$. (49)

$$\frac{100 \times 2\,w\,dw}{w^2} = \frac{d\left[\Delta p \frac{T}{B}\frac{1}{c.k}100\right]}{\Delta p \frac{T}{B}\frac{1}{c.k}}. \tag{50}$$

$$100\frac{dw}{w} = \frac{d\,\Delta p}{2\,\Delta p}100. \tag{51}$$

1 % error in $\Delta p = \frac{1}{2}$ % error in w.

$$= \frac{1}{2}\frac{dT}{273}100 = 0.18\,dT. \tag{52}$$

1° error in $T = 0.18$ % error in w.

$$= -\frac{1}{2}\frac{dB}{760}100 = -0.07\,dB. \tag{53}$$

1 mm error in $B = -0.07$ % error in w.

$$= -\frac{1}{2}\frac{dk}{1.3}100 = -3.8\,dk. \tag{54}$$

0.1 error in $k = -3.8$ % error in w.

TABLE 62.—*Coefficient of viscosity for air, μ.*

(55) Maxwell. $\mu = 0.000\,000\,0256\,(461° + t)\,F\,\frac{\text{pound}}{\text{foot}^2}\cdot\frac{1}{\text{foot}}$.

The pressure in pounds required to slide 1 square foot of air at the rate of 1 foot per second parallel to a layer 1 foot distant, when the temperature in Fahrenheit degrees is t.

Maxwell. $\mu = 0.000\,1878\,(1 + .00275\,t)$, C. G. S. units.
O. E. Meyer. 0.000 1727.
Compare Basset's Hydrodynamics, Vol. II, p. 251.

Coefficient of resistance for air, k.

(56) Poncelet and Unwin. $k = a\left[\frac{a}{\beta(a-1)} - 1\right]^2$ — Coefficient k 1.85

$a = \frac{A}{a} = \frac{\text{section of the current}}{\text{section of the body}}$

$\beta = \frac{a_1}{a} = \frac{\text{section of contracted current}}{\text{section of the body}}$

	For circular plates.	1.30
Morin.	For plates 1 foot square.	1.36
Thibault.	For plates 0.3 to 0.5 meter square, velocity 2 to 8 meters per second.	1.83
	For plane surfaces.	1.25 to 1.30
Mariotte.	Plates with low velocities.	1.74
Weissbach.	Fixed plates in a moving current of air.	1.25
Woltmann.	Experiments at Hamburg, 1785–1790.	1.19, 1.49, 1.34
Munche.	From experiments of Woltmann, de Borda, Hutton.	1.30
Dubuat.	Grashof's discussion.	1.43
Didion.	$k = 1.318 + \frac{0.565}{w^2}$.	1.32
Hutton.	Sphere for velocities under 90 meters per second, using a ballistic pendulum.	1.40
Nordmark.	Double conical bodies.	0.67
	Cylindrical bodies.	0.91
	Spherical bodies.	0.83
Piobert. Morin. Didion.	In joint experiments with plates 0.5 to 1.0 meter square, velocities 0 to 9 meters per second.	1.357
Poncelet.	Recommends as the result of discussing all data available to him.	1.30
De Borda.	Whirling machine, plates 0.10 to 0.03 square meter, velocity 3 to 4 meters per second.	1.39, 1.49, 1.64
Hutton.	Using Robbin's whirling machine, plate 0.01 to 0.02 square meter, and velocities up to 6 meters per second.	1.24, 1.43
Rouse.	Whirling machine. Pressure in pounds per foot², $p = 0.00492\,v^2$. Velocity in miles per hour.	1.85
Beaufoy.	Whirling machine, plate 1 foot square, velocity 2 meters per second, and for a larger plate.	1.15, 1.23
Prechtel.	Square plate rotating around one edge as axis	1.90
Rouse.	And the Royal Meteorological Society.	1.84

Hagen. Whirling machine with disks which were square, circular, and triangular, the average circumference being 0.50 meter, and velocities between 1.5 and 5.5 feet per second.

For C = circumference of the area $A = 0.50$ meter.

(58) $\Delta p = (0.00707 + 0.0001125\,C)\,A\,v^2$ (gram-decimeter second).

$\Delta p = (0.0707 + 0.01125\,C)\,A\,v^2$ (kilogram-meter second).

$\Delta p = (0.0028934 + 0.0001403\,C)\,A\,v^2$ (v in miles per hour, p in pounds, C in feet, and A in square feet).

From these results,
$k = 1.135 + 0.1805\,C = 1.135 + 0.090$. 1.225

Thiessen and Schellbach. Whirling apparatus with cylindrical bars. D = diameter 2 to 3 millimeters, L = length 0.3 to 1.0 meter.

(59) $\Delta p = (7.25\,v + 0.486\,D\,v^2 + 0.0000698\,D^2 v^3)\,10^{-6}\,L$, (C. G. S).

$\Delta p = (0.0000725\,v + 0.0486\,D\,v^2 + 0.0698\,D^2 v^3)\,L$, (M. K. S).

For $B = 760$ millimeters, and $t = 20$ °C,

$k = 0.00118\frac{1}{Dv} + 0.7914 + 1.1366\,Dv$ (for cylinders).

$k = 0.00154\frac{1}{Dv} + 1.008 + 1.448\,Dv$, (for squares).

Duchemin. *Reduction of rectilinear motion to circular motion.*

p = pressure for rectilinear motion with velocity v.
p_e = pressure for circular motion with velocity v.
A = area of greatest section of the body.
ρ = density of the fluid.
R = arm of rotation at the center of A.
x = distance of center of figure of A from the center of gravity of the half section of A on side of axis.
i = angle of incidence of air striking the front of A.
$\beta = \frac{1}{2}\sqrt{A}\cdot\sin i$ = thickness of the flowing stream on A.

$$p_e = p\left[1 + 1.624\frac{\beta}{k\,(R-x)}\right]. \tag{57}$$

$$k = 0.546\,\frac{1}{v} + 1.008 + 0.0040\,v$$

(for $D = 0.00275\,m$).

k for average velocities. 1.300

Thiebault. Thin plates on a whirling machine.

Square plate, $A=0.026$ square meter.	1.525
Square plate, $A=0.10304$ square meter.	1.784
Rectangular plate, $A=0.10304$, long side radial.	1.900
Rectangular plate, $A=0.10304$, short side radial.	1.677
Square plate, $A=(0.323)^2$, radius=1.370.	1.784
Square plate, $A=(0.227)^2$, radius=0.966.	1.784
Square plate, $A=(0.161)^2$, radius=0.685.	1.784

Langley. Whirling machine, square plate with velocities 4 to 11 meters per second. 1.31

Nipher. Railroad car direct wind pressures. 1.37

Dines.

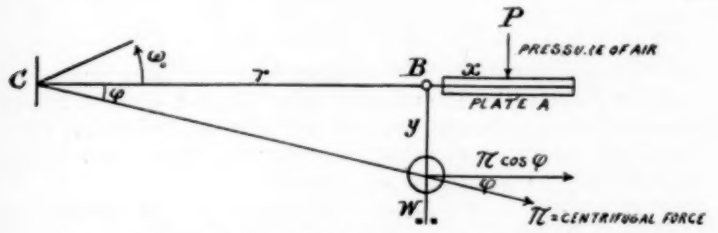

FIG. 38.—Special form of whirling apparatus used by Dines.

W = weight of adjustable piece.
ω_0 = angular velocity of rotation of W about C.
The piece $P\,B\,W$ is rigid and, by its rotation about B, assumes a position of equilibrium.

For equilibrium.

(60) $$Px = k\,23.68\,\frac{B}{T}\,(r+x)^2\,\omega_0^2\,A.x = \pi\cos\varphi.y.$$

$$\pi\cos\varphi\;.\;y = \frac{W}{g}\,\frac{(r^2+y^2)\,\omega_0^2}{\sqrt{r^2+y^2}}\cdot\frac{r}{\sqrt{r^2+y^2}}\cdot y = \frac{W}{g}\,\omega_0^2\,ry.$$

(60) $$k = \frac{T}{23.68\,B}\cdot\frac{W}{g}\,\frac{r\,y}{(r+x)^2\,x}\cdot\frac{1}{A}$$

Δp kil. / met.^{2} $= \lambda\,v^2 = \lambda\,(20.86)^2$ mile / hour $= \lambda\,(9.3)^2$ meter / sec.

$$k = \frac{\Delta p}{0.06593\,v^2} = 0.1754\,\Delta p\,\frac{kq}{m^2} = 0.8564\,\Delta p \text{ pound/foot}^2.$$

		λ	k
Squares	4× 4 inches	0. 00347	1. 29
	8× 8	340	1. 27
	12×12	361	1. 34
	16×16	350	1. 30
Rectangles	16× 1 inches	0. 00391	1. 45
	16× 4	363	1. 35
	24× 6	366	1. 36
Circular plates	4. 51 inches in diameter	0. 00347	1. 29
	6. 00	338	1. 25
	9. 03	345	1. 28
	13. 54	357	1. 32
		Mean 0. 00355	Mean 1. 32

(62) $\Delta p = 0.00355\,v^2$ (pound / foot^2 and mile / hour).
$v^2 = 281.7\,\Delta p$
$v = 16.78\,\sqrt{\Delta p}$.

Stokes. *The resistance to any moving body immersed in a fluid is composed of two parts.*

1. That due to viscosity and proportional to v is av.
2. That due to gyratory motions varying with the v^2 and the boundaries of the fluid is bv^2.

The second may disappear in slow motion but the first remains appreciable.

$\frac{\mu}{\rho}$ = coefficient of viscosity div. by density.
r = radius of sphere.

(63) $$\Delta p = 6\,\pi\,\frac{\mu}{\rho}.\;\rho\,r\,v = 6\,\pi\,\mu\,r\,v \text{ inch/second}.$$

Stokes finds $\mu = \rho\,(0.116)^2$ for air.
The maximum velocity of a falling body becomes permanent when,

(64) $$w_m = \frac{2g}{9}\,\frac{\rho}{\mu}\left(\frac{\rho_w}{\rho} - 1\right)r^2 = \frac{2\,g\,r^2}{9\,\mu}\,(\rho_w - \rho).$$

ρ_w = density of the sphere.
ρ = density of the fluid thru which it falls.
g = acceleration of gravity in inches, 386 inches.
w = velocity inch/second:
1 inch/second = 0.0254 meter/second.
For small drops of water at small velocities the viscous resistance of the air is far larger than the impact resistance, as computed by the Newtonian theorem.
For $r = 0.0005$ inch, water $\rho_w = 1$, air in the lower clouds, $\rho = 0.001$, we find $w_m = 1.593$ inch/second = 0.133 foot/second.

Recknagel. Pressure at the center of the front of a plane plate and at the apex of a solid of revolution.

p = pressure in still air surrounding plate, kilogram/meter^2.
$m = \frac{\sigma_0}{g} = \frac{1.293}{g}$ = mass of 1 cubic meter of air.
v_0 = velocity of the air relative to center of plate, meter/second.
$\frac{C_p}{C_v} = k = 1.41$ = ratio of specific heats.
$\frac{k-1}{k} = 0.2908$.

(65) $$p_1 = p\left(1 + \frac{k-1}{k}\cdot\frac{v_0^2}{2g}\cdot\frac{\sigma_0}{p}\right)^{\frac{k}{k-1}}$$ for any velocities.

$p_1 = p + \frac{1}{2}\,m\,v_0^2$ for low velocities.
The pressure diminishes from the center to the edge of the plate.

Schreiber. A discussion of the distribution of the pressure over a flat plate is given on pages 36–38, of Studien über Luftbewegungen, von Paul Schreiber, Abh. d. Kon. Sächs. meteorol. Inst. Heft 3, 1898.

Nipher. A complete experiment of the distribution of pressure over a plate is given in his paper, "A method of measuring the pressure at any point on a structure, due to wind blowing against that structure," by Francis E. Nipher, Transactions of the Academy of Science, St. Louis, Mo., Vol: III, No. 1.

This agrees with the formula, given by Hann on page 11, Über die tägliche Drehung der mittleren Windrichtung, etc. Wien, 1902.

Table 53, formulas 14, 15, deduces the barometric gradient which, acting along the meridian from south to north, will just sustain the wind velocity v directed due eastward. This is the formula for determining the relation between the eastward drift of the atmosphere in the upper strata and the normal gradient which is required to sustain it. This is also found on page 11 of Hann's paper and on page 472 of his Lehrbuch der Meteorologie.

Table 54, formulas 16–21, contains the deduction of the Newtonian theorem for the pressure exerted by wind velocity on a body. The general equation becomes

$$-p = \rho \frac{w^2}{2g} + \rho h. \tag{19}$$

In case there is equilibrium between the weight represented by ρh and the pressure exerted by a vertical velocity w^2, so that $p = 0$, we have

$$\frac{w^2}{2g} = h. \tag{20}$$

which is the law of the velocity for a freely falling body.

Hence, the pressure exerted by the first term, $\rho \frac{w^2}{2g} = p_N$, is the Newtonian pressure.

From observations it is found that this pressure must be multiplied by some factor k, to reduce it to the actual pressure which is exerted upon a rigid body of sensible dimensions. When such a body moves thru a still fluid, or when a moving fluid passes a fixt body, the stream lines of the fluid are deflected in passing the body, making an excess of pressure on the front side, $+ \Delta p_1$, and a defect of pressure on the back side, $- \Delta p_2$, so that the total resultant pressure is

$$+ \Delta p_1 - (- \Delta p_2) = + \Delta p_1 + \Delta p_2.$$

This is not equal to the Newtonian pressure, but differs from it by some factor, $k = \frac{p \text{ (observation)}}{p \text{ (Newton)}} = \frac{p_0}{p_N}$. The deflection of the stream lines causes vortices and hydrodynamic pressures of a complicated kind, which are integrated in the total excess of pressure of the positive and the negative types. Many experiments have been made to determine the relations between the front and the back pressure, but they depend largely upon the shape and size of the body and the density of the fluid. The existence of a diminished pressure and consequent inflow, or so-called "suction", on the leeward side of bodies exposed to the wind has been generally recognized,[1] but the experiments of Mr. Irminger, a Danish engineer, made to determine the amount of such suctions, shows it to be present to an unexpected extent. His measurements were made by the use of hollow plates and models of thin sheet iron exposed in an air duct 4½ by 9 inches cross section, at various angles and positions, to velocities ranging from 16 to 32 miles per hour. We quote the data from Julius Baier's paper on wind pressures in the St. Louis tornado, American Society of Civil Engineers, Vol. XXXVII, 1897, No. 805. (See Table 63.)

This shows that the percentages vary widely with the shape of the body, and its exposure to the direction of the wind, and that the lee suction is often much in excess of the front pressure. For spheres the front pressure is 28 per cent and the back suction 72 per cent of the total pressure p. The total pressure on a sphere is only 57 per cent of that on a thin plane having each side equal to the diameter of the sphere. The subject is very complex in application to special cases.

[1] See Abbe in the Monthly Weather Review, November, 1886, Vol. XIV, p. 332, and his publication of observations on the pressure and suction around the Weather Bureau station at Mount Washington, N. H., in his Meteorological Apparatus and Methods, pp. 142–144. See also the results of experiments on chimneys and cowls, Proc. Am. Acad. Arts and Sciences, Boston, 1848; Journal Franklin Institute, Philadelphia, 1842.

TABLE 63.—*Percentage of front and back pressures (Irminger's results).*

PRESSURE IN A HORIZONTAL DIRECTION		PRESSURE ON THE WINDWARD SIDE %TOTAL PRESSURE	SUCTION ON THE LEEWARD SIDE %TOTAL PRESSURE
→	p	45	55
	0.95p	57	43
	0.79p	24	76
	0.57p	28	72
	0.25p	18	82
	0.59p	58	42
	0.42p	14	86
	0.71p	63	37

The wind velocities are usually taken in the United States by the Robinson anemometer, but the indicated velocities must be reduced about 20 per cent, in order to obtain true values of the velocity to enter into the formula.

The reduction factor from miles per hour to meters per second is as follows:

1 mile per hour = 0.4470 meter per second.

MARVIN'S CORRECTION TO OBSERVED WIND VELOCITIES.

The velocity of the wind is very generally measured by some form of the Robinson cup anemometer. From early experiments it was found that the distance passed over by the center of one of the revolving cups would, if multiplied by three, give the velocity of the wind, and the wheels and recording dials of the instrument were geared to read wind velocities directly by taking into account this factor of reduction. Later experiments have shown that with anemometers of the size commonly used this ratio is erroneous, and the indicated velocities are about 20 per cent too great, but no change has been made in the recording device and the "wind observations published by the various meteorological institutions at the present time have only a relative, but not absolute, value. It is very probable that many experiments on the relations of wind velocities to wind pressures have been made in which this anemometer correction has not been properly applied".

Professor Marvin has determined the correction to be applied to the readings of the standard form of anemometer used by the Weather Bureau. It is expressed by a logarithmic formula from which the following table taken from his report on wind pressures is computed:

TABLE 64.—*Corrected wind velocities as indicated by a Robinson anemometer, in miles per hour.*

Indicated velocity.	0	1	2	3	4	5	6	7	8	9
0	.....	.....	.....	.....	.....	5.1	6.0	6.9	7.8	8.7
10	9.6	10.4	11.3	12.1	12.9	13.8	14.6	15.4	16.2	17.0
20	17.8	18.6	19.4	20.2	21.0	21.8	22.6	23.4	24.2	24.9
30	25.7	26.5	27.3	28.0	28.8	29.6	30.3	31.1	31.8	32.6
40	33.3	34.1	34.8	35.6	36.3	37.1	37.8	38.5	39.3	40.0
50	40.8	41.5	42.2	43.0	43.7	44.4	45.1	45.9	46.6	47.3
60	48.0	48.7	49.4	50.2	50.9	51.6	52.3	53.0	53.8	54.5
70	55.2	55.9	56.6	57.3	58.0	58.7	59.4	60.1	60.8	61.5
80	62.2	62.9	63.6	64.3	65.0	65.8	66.4	67.1	67.8	68.5
90	69.2	.....	.....	.....	.....	.....	.....	.....	.....	.....

Total velocity = number on side and number on top of same column. Thus, for 41 the corrected velocity is 34.1; for 57 the corrected velocity is 45.9.

Table 55, formulas 22–31, contains the formulas for the vertical velocity that just sustains a freely falling body. The successive steps are clearly indicated. In formula 24 the coefficients are computed for the value of $k = 1.3$ employed by Professor Schreiber. Since the weight of a body, $W_g = \frac{4}{3}\pi r^3 \rho \times 1000$ kilograms, must be put equal to $\Delta p_A = \Delta B \sigma_m \frac{1}{2}\pi r^2$ for equilibrium under the specified conditions, further formula can be developed. The area A in (23) is

taken as equivalent to half the greatest cross section, so that $A = \frac{1}{2}\pi r^2 = \frac{1}{8}\pi D^2$. According to Irminger's tests the coefficient of πr^2 should be 0.57 instead of 0.50. The specific weight of the body $= \rho_w = \frac{\rho_w}{\rho_1}$, where the specific weight of water is the unit. The density of the air at any point is found by the usual formula $\rho = \rho_0 \frac{B}{B_0}\frac{T_0}{T}$. Formulas 28–31 contain the several relations found by putting (24) in combination with (25).

Velocities.

Formulas 32–35 of Table 56 contain the resulting velocities in the kilogram-meter-second system (M. K. S.). In the centimeter-gram-second (C. G. S.) system for the barometric pressure B, the radius r, and the diameter D in centimeters, for the density ρ in grams, and the velocity in meters per second, we have the values of the velocity w, as given in formulas 36–39. Formula 36 gives the velocity in meters per second in terms of the absolute temperature T, the barometric pressure B in centimeters, the radius of sphere in centimeters, the specific weight of the body in grams. The coefficient k must be assigned from experimental data. Formula 37 employs the same data as 36 except that the diameter is used instead of the radius. Hence, $10.61 = 7.503 \times \sqrt{2}$ and $20.112 = 14.221 \times \sqrt{2}$. In 38 and 39 the substitution $\frac{B_0}{B}\frac{T}{T_0} = \frac{\rho_0}{\rho}$ is made, in case one prefers to use the densities rather than the pressures and temperatures. We have taken formula 37 for development and application to the formation of hail.

Formula 37, $w = 7.503\sqrt{\frac{T}{B} D \rho_w \frac{1}{k}}$. The first section of the table contains $w = 7.503\sqrt{\frac{T}{B}}$ for the argument T and B. T begins at 273°, since in hail formation the temperature does not fall below 0° C., and it extends to $T = 313°$, which is the extreme of summer heat at the surface. Approximate values of B are taken at the heights H as indicated, so that H or B may be used in practical applications. If $D = 1$ centimeter, $\rho_w = 1$ for water, and $k = 1$, the velocity in meters per second is found in the body of the table. In application to water drops of various sizes, large drops 0.70 to 0.50 cm., common drops 0.40 to 0.20 cm., fine drops 0.100 to 0.001 cm., the subjoined multiplying factor $\sqrt{D}$ must be used. In the case of hail, for $\rho_w = 0.917$, the tabular factor ranges from $D = 10$ cm. to $D = 1$ cm. giving the several values of $\sqrt{D\rho_w}$. It is shown in the following tables that the coefficient k is equal to about 1.30 for bodies of considerable dimensions, such as engineers naturally employ, plates, disks, spheres, cubes, and parallelopipeds placed on whirling machines for tests. These can hardly be true for water drops which are not rigid, but very flexible in their form while falling, since they undergo periodic changes in shape when in motion, like oil drops rising in water. It is difficult to assign values to k for fluids, and on that account the factor has been kept separate from the first section of the table. My opinion is that $k = 1.0$ nearly for water, but that on the solidification into hail, the value of k approaches $k = 1.30$, in consequence of its rigid shape in the solid state, which is of dimensions comparable with those used in the physical experiments. These tables can be readily used in numerous combinations, by selecting the suitable sets of factors to be multiplied together. The effect of k is to diminish the required velocity w in meters per second, since the form of the body generates a term which is itself equivalent to an addition to the actual wind velocity. The required velocity increases with the dimensions of the body, and with the increase of density of bodies of the same dimensions.

Conversion factors.

Tables 57, 58, and 59 contain the conversion factors between several systems of units which are found in the papers relating to the velocities and pressures. Table 57 gives the units of length L, the units of mass M, the pressure $p = \frac{M}{L^2}$. Table 58 gives the distance S traversed in the unit of time, the unit of time T, the velocity $V = \frac{S}{T}$. Table 59 gives various combinations between the pressure and the velocities for several systems of units. For example, the pressure in pounds per square foot with the velocity in miles per hour, becomes the pressure in grams per square centimeters with the velocity in meters per second, by multiplying with the factor 2.443 (logarithm = 0.38795). The inverse reduction is performed by multiplying with $\frac{1}{2.443} = 0.4093$ (logarithm = 9.61205).

Resistance to a solid moving in a fluid.

The problems in hydrodynamics relating to solids moving in a fluid, or to a fixt solid in a moving fluid, are very numerous and their discussion can be found in several treatises. In Table 60, formulas 40 to 42, the Newtonian theorem is resumed in connection with the factor k. But it was shown that there is a factor k_1 for the front side of a plate or solid of any form, and a factor k_2 for the back side of this body. The wind pressure is made up of two parts $\Delta p = \Delta p_1 + \Delta p_2$, and the factor k of two parts $k = k_1 + k_2$. These must be determined for special objects, and their values can not be assigned from general considerations.

Differential coefficients.

The variations of pressure Δp depend upon changes in the barometer height ΔB, the temperature ΔT, the coefficient k, and the velocity w. Table 61, formulas 43 to 54, contains the differential coefficients, and the corresponding changes of the terms in percentages. Thus—

$+ 0.1\ \Delta k = 7.7\ \%\ \Delta p.$
$+ 1^{mm}\ \Delta B = 0.13\%\ \Delta p.$
$- 1°\ \Delta T = 0.37\%\ \Delta p.$
1 % error in $\Delta p = 0.5$ % error in w.
1° error in $T = 0.18\%$ error in w.
1^{mm} error in $B = 0.07\%$ error in w.
0.1 error in $k = 3.8$ % error in w.

These values of the ratios are convenient in estimating the mutual changes which take place among these quantities.

The resistance coefficient k.

It is evident that an error in the value of the resistance coefficient k is much more efficient in producing an error in the wind velocity as computed than are similar errors in the determination of the barometric pressure and temperature. It is, therefore, important to discuss the coefficient k with much care, and to pass in review the results of the experiments which have been executed for the purpose of establishing its value under different conditions. These involve bodies of different sizes and shapes, carried thru fluids, such as air and water, with variable velocities. The experiments extend thru the past century, and many of them bave been executed with all possible care as to details, in order to secure scientific precision. Summaries of these studies may be found in Abbe's[2]

[2] Treatise on Meteorological Apparatus and Methods, by Cleveland Abbe, Appendix 46, Annual Report Chief Signal Officer, 1887, pages 218–240. Mechanics of the Earth's Atmosphere, C. Abbe, Translation of Hagen's paper, Smith. Misc. Coll., 843, 1891.

and in Schreiber's[3] compilations to which I am chiefly indebted for the accompanying data. The original papers are enumerated therein, and the bibliography need not be repeated in this place.

Table 62, formulas 55 to 65, contains the summary of values of k, together with a brief statement regarding the nature of the experiments and the fundamental formulas of the instrumental work. Formula 55 gives Maxwell's value of the coefficient of viscosity in British units and in C. G. S. units, with reference to Basset's Hydrodynamics. Formula 56 gives Poncelet and Unwin's equation, which takes account of the contraction and expansion of the stream lines in passing by a body. Formula 57 gives the equation for transforming the pressure on a body moving rectilinearly into that encountered by it when carried on a whirling machine. The group of equations under formula 58 contains Hagen's results in (C. G. S.,) (K. M. S.), and (P. F. S.) units, respectively. It is to be observed that a considerable factor depends upon the circumference of the plates, and that the value of $k = 1.104$, when the circumference is very small, as in raindrops. Formula 59 contains the result of Thiessen's and Schellbach's experiments on long cylindrical rods whirled by a machine, and it shows that there is a complex function depending upon the first and second powers of the velocity which is involved in the coefficient of resistance. Formula 60 gives the equation for equilibrium in Dines's machine, which has a special device for determining the pressure (fig. 38). The rectangular arm $P\,B\,W$ is rigid and rocks upon the axis B; the arm $B\,W$ is stayed between two stops, with electric contact, so that the length of the working arm for W can be accurately adjusted to the whirling pressure P on the plate A. Formula 61 gives the equation for k and the accompanying table of values for λ and k. λ is the coefficient required to find the pressure in pounds per square foot from the velocity in miles per hour, and it averages $\lambda = 0.00355$, which appears in formula 62, $\Delta p = 0.00355\, v^2$. Professor Marvin has established the value for the Weather Bureau $\lambda = 0.00400$, from which $\Delta p = 0.00400^2$. Professor Nipher has determined the value $\lambda = 0.00251$ on the windward side alone, so that from Irminger's experiments we are safe in taking the total value as that given by Dines or Marvin for general conditions. The result of Stokes's investigation on the resistance of any moving body immersed in a fluid shows that it consists of two parts, the first due to viscosity proportional to the velocity, and the second due to the gyratory motions which are generated in the fluid under the existing conditions, proportional to the square of the velocity. Formula 63 gives Stokes's equation and the value of μ for air, with a velocity v in inches per second. There are, however, other methods of determining the viscosity which are considered better, referred to in 55. Formula 64 gives the maximum velocity of a falling body when it has become uniform, with an example for a raindrop in the air. Since the pressure on a large plate varies between the center and the edge by certain laws to be discovered by experiment, the distribution of the pressure has been discust by Recknagel, Schreiber, and Nipher. Formula 65 contains Recknagel's equation for any velocities, the terms being specified. For Schreiber's and Nipher's results reference may be made to their papers.

It will be seen by inspecting the catalog of values for k, the coefficient of resistance to a rigid body moving in air, since the water experiments have not been included in the list, that there is a great diversity of data to be considered in selecting a mean value. This arises from the great variety of conditions involved in the investigations, and also from the great length of time covered in the researches, about 100 years. At the same time it is evident that they average closely to the value assigned by Schreiber, $k = 1.30$. This value applies generally to rather large objects, plates, disks, and solids having a normal sectional area of one square foot or more. For small bodies, such as drops of rain or even hailstones, I am inclined to believe that Ferrel's value of k is nearly correct, that is $k = 1.10$. The uncertainty, however, is such that it must be left to the investigator to make his choice as to the adopted value. Consequently in Table 56 I have kept the value of k apart from the section containing the vertical velocity w. If we choose for hailstones an average diameter of one centimeter, I suppose that nine-tenths of the value of w given in the column under 273 at the several heights is about what may fairly be expected as the sustaining velocity in meters per second up to a height of 8000 meters. That is, the value of w at the freezing temperature and the height at which hail forms is as in the following table:

TABLE 65.—*Probable sustaining vertical velocities, w, for hailstones.*

Height.	Probable sustaining velocity.	
	For common hailstones.	For very large hailstones.
Meters.	*M. per s.*	*M. per s.*
0	12.8	25.6
1000	13.6	27.2
2000	14.4	28.8
3000	15.3	30.6
4000	16.2	32.4
5000	17.2	34.4
6000	18.3	36.6
7000	19.3	38.6
8000	20.5	41.0

[3] Studien über Luftbewegungen, von Paul Schreiber, Adh. d. Kön. Sächs. Met. Inst. Heft 3, Chemnitz, 1898.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

From September 30 to October 3 a severe storm advanced from the Azores over the British Isles and northwestern continental Europe, attended on October 2 and 3 by disastrous gales on the French and British coasts. On the morning of September 30 the following was cabled to Lloyds, London: "Severe storm south of Azores will probably move northeastward". Pressure continued low over the British coasts, except on the 25th and 27th, with marked barometric depressions on the 15th, 22d, and from the 28th until the close of the month. The depression of the 28th–31st continued during the early days of November, covered western Europe, and caused storms as far south as the Mediterranean. The center of a severe storm that passed near the Azores on the 18–19th crost the British Isles on the 22d. During the period of low barometric pressure over the British coasts, and especially from the 28th until the end of the month and during the first days of October, the barometer continued high over the eastern half of the United States, with attending fair and cool weather. Over the western half of the United States this period was marked by a succession of depressions of slight intensity that were attended by unsettled and rainy weather, with snow in the mountain districts and the Northwest.

In the United States the first important storm of October advanced from the north Pacific coast to the Canadian Maritime Provinces from the 1st to the 7th, and on the morning of the 7th a barometric pressure of 28.68 inches was reported at its center. The area of high pressure that followed this storm moved from the north Pacific coast to the Gulf States and

thence northeastward off the Atlantic coast, and in its front the first snow of the season occurred at points in eastern Colorado.

The period from the 19th to 23d was stormy in the middle Rocky Mountain districts. In Denver and Cheyenne the depth of snowfall was nearly two feet, and in the mountains of Colorado and north-central New Mexico snow fell to a depth of six to thirty-six inches. The snowstorm extended from this region over South Dakota, western Nebraska, western Kansas, the Texas panhandle, northern Arizona, and Utah. In Utah a severe windstorm set in during the night of the 20th and continued on the 21st, causing considerable damage. At Salt Lake City a maximum velocity of 52 miles an hour from the northeast was registered. Snow fell in the upper Lake region on the 29th, and a heavy fall of snow occurred in western and northern New York on the 30th and 31st. Following the passage of the low area (VII) that contributed to the storm period referred to, frost occurred in the interior of the Southwestern States from the 23d to 25th.

The following from Mr. C. P. Horton, Bourne, Mass., refers to a special frost-warning service that has within the last two years been in operation in the cranberry district of Massachusetts:

I have to thank you, in common with all the growers of cranberries in this section, for your timely warnings of frost, which in one case at least saved us from serious loss. I consider the service of the Bureau is of very great value to the growers of the principal crop here.

Attending an area of low barometer that moved northeastward from the Gulf of Mexico during the 5th, a small tornado past over the western portion of New Orleans about 9:30 a. m. of that date, injuring several persons and causing some damage to property.

THE WEST INDIAN HURRICANE OF THE SECOND DECADE OF OCTOBER, 1906.

This storm apparently had its origin over the eastern Caribbean Sea early in the second decade of the month, and drifted westward as a shallow barometric depression that covered practically the entire West Indian-Caribbean Sea region.

On the morning of the 17th, reports indicated the presence south of western Cuba of a well-defined cyclonic disturbance, and at 11 a. m. of that date storm warnings were ordered on the east Gulf, Florida, and south Atlantic coasts, and the following was telegraphed to Atlantic and Gulf ports and to Havana, Cuba: "* * * Disturbance apparently approaching western Cuba from the Caribbean Sea. Unsafe for vessels next few days off western Cuba, Florida, and south Atlantic coasts".

The center of the storm past near and east of Havana at 11:30 p. m. of the 17th, with minimum barometer, at Havana, 28.86 inches, and by the morning of the 18th, had reached a position near and to the eastward of Key West, where at 3 a. m., a minimum barometric reading of 29.30 inches was registered. Moving thence northeastward to a point about opposite the South Carolina coast the center recurved to the westward, and was then forced southward over the Florida Peninsula by an area of high barometer that covered the north Atlantic coast districts.

Senor Luis G. Carbonell, Chief of the Meteorological Service of Cuba, reports that in its passage over Cuba the storm was of great intensity, small diameter, and rapid march, and that its force extended to the west as far as Pinar del Rio, with strong winds from the north to northwest, and to the east about as far as Cardenas; that great damage was not caused in the provinces of Matanzas and Pinar del Rio, but that in the Province of Havana there was great destruction of cane, trees, and all plants in general. In the city of Havana there were some fatalities caused by the falling of houses that were in bad condition.

The following report of the storm is made by Mr. F. E. Hartwell, Assistant Observer, Weather Bureau, Key West:

Storm warnings ordered and advices received 11:35 a. m., 17th. Wind gradually increased, and backed from east to northeast at 6 p. m., where it held until after midnight. Barometer fell steadily after 6 a. m., and at midnight stood at 29.45 inches. Up to midnight the wind velocity did not exceed 30 miles an hour. About 3:30 a. m., of the 18th, the wind backed to north, and by 4:30 a. m., to northwest. The barometer fell until 3 a. m., with minimum reading 29.30 inches. The center of the storm past very near and southeast of the station. At Sand Key the lowest reading was about 29.25 inches, and wind velocities as high as 75 miles an hour were recorded at that station. The highest velocity at Key West, 54 miles an hour, occurred at 7:20 a. m., of the 18th.

Every effort was made to give the warnings the widest possible circulation, and little damage was done on the island. Among the small boats in the harbor those taking precautions escaped, but others suffered considerable damage, and some were destroyed by pounding against the docks. The Revenue cutter *Fessenden* was the only large vessel that received injury in this port. The Mallory steamer *Concho* remained in port about forty-eight hours, and the Peninsula and Occidental steamers *Mascotte* and *Miami* were held for a considerable time. The progress of the storm up to the keys was marked by very high water, which, with the wind, caused much destruction of property. The quarter boats of the East Coast Extension were carried out to sea and many lives, probably more than 100, were lost. Forty-nine men were picked up by the Austrian steamer *Jenny* and returned to Key West, 24 were landed at Savannah, Ga., and a number were picked up by other steamers.

Mr. Dan Ross, master of the tug *Sybil*, moored at Miami, Fla., furnishes the following extract from his log:

October 17.—Got ready for sea at noon, but as northeast storm warnings were displayed, had orders to wait developments. October 18.—4 a. m., northeast gale blowing, with much rain. Barometer falling rapidly. At 9:30 a. m. wind died out, and lowest barometer (28.55 ?) was noted. The calm lasted about thirty minutes, then came on a blow from the northwest, backing to west-northwest and blowing very hard until noon, when it began to abate, and by night the gale had ceased.

Mr. H. P. Hardin, Observer, Weather Bureau, Jupiter, Fla.:

No damage resulted in this vicinity, as the warnings had caused measures of protection to life and property before the storm reached here. At the extreme southern end of the State where the Florida East Coast Railway Company is building its line over the keys and water into Key West, the company's property loss was about $200,000. Planters on the larger keys lost their orange groves, pineapple fields, and homes, and in some cases the losses were so complete that the places have been abandoned. Six lives are reported to have been lost on plantations thus destroyed. The storm caught most of the several hundred laborers and mechanics of the railway extension on houseboats and other clumsy craft moored to piling for living quarters. These boats were torn from their moorings and beaten to pieces by the seas. The loss of life among these men was about 135. One hundred and fifty men were picked up at sea on wreckage by steamers bound in and out of the Gulf. One passenger steamer, the *St. Lucie*, an old river packet, was swamped and 23 of the 80 people on board were lost near Elliotts Key.

The following report of a storm that visited the Nicaragua coast October 9, 1906, has been made by Dr. W. F. Thornton, Bluefields:

Inclosed find my report for October. I add barometer readings for October 9, the day of the storm on this coast. Fortunately Bluefields was but slightly damaged, a few trees uprooted and some corrugated roofing torn off. Beginning twelve miles north, and having a width of twenty to twenty-five miles, the storm swept everything before it. It traveled from east to west and was accompanied by a tidal wave. Some reefs that before the storm were two or three feet below the surface are now four or five feet above. Small cays have disappeared from the surface; especially two small cays (Seal Cays), one having four and the other twelve cocoanut palms, and used as a point by navigators when passing between the mainland and the Corn Islands, can no longer be seen. The tidal wave affected the coast for eighty miles, extending from ten miles north of Bluefields to the north. Its greatest height was fifteen feet. The following are barometer readings made at Bluefields:

Date.	Hour.	Pressure.	Date.	Hour.	Pressure.
October 9,	7 a. m.	29.91	October 9,	8 p. m.	29.60
	12 noon	29.87		9 p. m.	29.59
	1 p. m.	29.85		9:30 p. m.	29.57
	2 p. m.	29.82		10 p. m.	29.60
	3 p. m.	29.78	October 10,	1 a. m.	29.66
	4 p. m.	29.72		3 a. m.	29.70
	5 p. m.	29.68		5 a. m.	29.74
	6 p. m.	29.63		7 a. m.	29.81
	7 p. m.	29.62			

Colon, Panama, is the only station in the southwestern Caribbean Sea that reports by telegraph to the Weather Bureau at

Washington. Barometric pressure began to fall at that station on the 6th and continued to fall until the morning of the 9th, when a reading of 29.72 inches was reported. At 9:30 p. m. of that day the storm center, traveling in a westerly course, struck the Nicaragua coast line north of Bluefields, and did not thereafter appear within the region of telegraphic observation.

Mr. A. J. Mitchell, Observer of the Weather Bureau at Jacksonville, Fla., reports as follows:

It may be appropriate to say that ample warnings were issued in advance of the storm. Special messengers were sent to outlying points, and so far as possible thoro warning was given in Monroe, Dade, and the lower portion of Brevard counties, where the damage was greatest. At Miami many houses were blown down or damaged, and horticultural interests suffered much loss. The losses in and about Miami amounted to about $160,000. The loss of life among laborers extending the Florida East Coast Railway is placed at 124. The men lived in houseboats that were swept out to sea. The islands behind which the boats were anchored had afforded ample protection against previous storms. The stern-wheel steamer *St. Lucie*, used as a transport for the railway company, left Miami about noon of the 17th. The northeast storm warning was flying at that time and messages from the Central Office urged vessels to remain in port. The *St. Lucie* was lost and many of her passengers were drowned, but it may be well to state that the master of the vessel left port without consulting the proper officials of the railway, who always direct that proper precaution be taken on the Weather Bureau warnings.

The American Consul, José de Olivares, at Managua, Nicaragua, under date of October 26, reports:

I have the honor to report that during the interval of two weeks, from October 8 to 22, this entire Consular District was visited by what was probably the severest rainstorm that has ever occurred in this part of the world. In the great valley lying between the two mountain systems here in western Nicaragua, in which are situated Lakes Managua and Nicaragua, the most notable characteristic of the storm was the almost continuous torrential rainfall, which in the rural districts resulted in much damage to public roads, and in the cities and towns was the cause of considerable suffering, by reason of the insufficiency of the houses to resist the ingress of the rain, which literally filtered through the tile roofs and in many instances absolutely flooded the interiors. At the consulate, notwithstanding that it is housed in one of the most substantial structures in the capital, the same conditions obtained, the floors being converted into great pools of water and it being necessary to keep the furniture constantly covered with oilcloths.

Among the poorer classes much misery, attended with a great deal of sickness and an unusual number of deaths, has been one of the most serious results of the storm.

From San Juan del Sur our consular agent reports the same character of weather, which constituted a great obstacle to the commerce and general traffic thereabouts. At Corinto, in addition to the downpour of rain there was experienced an unusually heavy sea, which badly damaged a part of the new dock in process of construction at that port.

But the severest conditions and worst results in this district are reported from our consular agent at Matagalpa, in the northern mountain section of this country. The rainfall thereabouts resulted in a number of serious floods causing extensive damage to the plantations, and washing away the roads and bridges throughout that locality. In several cases tremendous landslides, carrying away whole hillsides, occurred. The crops in general suffered badly, the corn being entirely destroyed in many sections.

Taken together with the disastrous tempest that is reported to have laid waste almost the entire eastern seaboard of this country, the results of the storm in general to Nicaragua are appalling in the extreme.

BOSTON FORECAST DISTRICT.

The weather, generally speaking, was pleasant. The temperatures ranged near the seasonal average, without marked extremes. The precipitation was also somewhat in excess of the normal, altho unevenly distributed over the section. Snow fell to a depth of several inches on the closing days of the month in parts of New Hampshire and Vermont, but elsewhere the precipitation was in the form of rain. During the first week of the month there was an unusual prevalence of fog in coast sections that inconvenienced and greatly delayed shipping. No severe general windstorms swept the coast, altho increasing easterly winds on the 30th and 31st reached strong gale force along the southern coast. Storm warnings were displayed on the 8th, 15th, 18th, 19th, 27th, and 28th. Frost warnings were issued to cranberry growers on the 9th, and were followed by generally killing frosts and freezing weather.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

Frost warnings were issued on several dates and all were justified, except the one on the 22d, when an area of low pressure developed over the lower Missouri Valley during the succeeding twelve hours, and the high pressure failed to move eastward as was anticipated in the forecast. General frost occurred over the northern portion of the district on the 28th and 31st. Frost did not occur without warnings, except possibly over very limited areas. No cold waves occurred during the month and no warnings were issued. There were no general storms along the west Gulf coast during the month and no warnings were issued.—*I. M. Cline, District Forecaster.*

LOUISVILLE FORECAST DISTRICT.

Ideal fall weather prevailed during the month. The temperature was for the most part normal, altho the main event of the month was the unusually early cool wave of the 10–12th, when killing frost occurred generally thruout the district, and freezing temperature in the eastern portion. There were quite heavy flurries of snow over northern and eastern Kentucky the 10th—the earliest snow in this section since the records of the Weather Bureau began. Six general storm disturbances past over or near the district during the month, but the most pronounced one was that of the 26–27th, which was attended by high winds, tho only light showers. Frost warnings were issued on the 1st for light frost in parts of Kentucky; on the 9th for light frosts in both States, and on the 10th for killing frosts for the entire district. These warnings were fully verified, except the one on the 1st.—*F. J. Walz, District Forecaster.*

CHICAGO FORECAST DISTRICT.

The weather in this district during the month of October was not especially eventful, altho the temperature was below the normal during most of the second decade. Neither were the storms on the Lakes especially severe. Warnings were ordered on the morning of the 8th for a storm which developed over the upper Mississippi Valley, and these warnings were continued at several stations over the 9th. High winds were quite general. Warnings were again ordered on the morning of the 24th for a storm which had moved from the southwest with increasing intensity, and was central on the 24th over Iowa. This storm rapidly crost the Lake region with brisk to high winds and was central on the morning of the 25th in Ontario. Still another storm developed over the Lake region on the 26th and 27th, and by the morning of the 27th had increased greatly in energy, passing rapidly eastward with general high winds. The warnings for the storm were ordered on the 27th.—*H. J. Cox, Professor and District Forecaster.*

DENVER FORECAST DISTRICT.

The month was drier and somewhat milder than usual west of the Continental Divide, while an excess of precipitation with mean temperatures below normal was general on the eastern slope. The night of the 19th marked the beginning of the snowstorm which was exceptionally heavy and prolonged on the eastern slope. In southeastern Wyoming and northeastern Colorado the storm was continuous until the night of the 23d. While the accumulated fall was considerable during the first two or three days little or no damage resulted until the 23d, on which date high winds set in early in eastern Wyoming and northeastern Colorado, drifting the snow so badly as to cause a serious blockade on the different railroads. The important phases of this storm were well covered by the forecasts, and on the 21st warnings were issued for the cold wave that visited northern New Mexico. Frosts were frequent during the first and second decades; they were accurately forecast.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.

The month was comparatively free from storms, high winds, or heavy rains. On October 16 a depression of considerable energy appeared on the northern coast, and southeast storm warnings were ordered for Eureka. The storm passed rapidly eastward, influencing only the extreme northern end of California. A sharp fall in temperature occurred in northern Nevada on October 17.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.

As usual at this season of the year a number of low pressure areas made their appearance in British Columbia and moved eastward across the Rocky Mountains. The centers of most of these disturbances were too far north to cause gales and rain in this district, except in its northwest corner, where a few stations reported from one to two inches more than the usual amount of rain. The rainfall was generally deficient in the remaining portion of the district and in its southern portion the deficiency was marked. The principal stormy periods were on the 2d, from the 11th to the 15th, inclusive, and on the 24th and 25th. Frequent light frosts occurred in exposed places, and on the mornings of the 20th, 21st, and 22d frosts were general in western Oregon and western Washington. No gales or frosts occurred without timely warnings having been issued.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

Abundant rains thruout the South during the first four or five days of the month brought a general response from the rivers, except those of the extreme southwestern districts, and in many localities flood stages were reached and past. Warnings of stages exceeding 40 feet during the ensuing three or four days were issued on the 1st, for the lower Tombigbee River, and the 40-foot stage was past during the 6th, when a supplementary warning was issued for a further rise to about 45 feet within three or four days. On the 10th a crest stage of 44.5 feet, 9.5 above the flood stage, was reached at Demopolis, Ala.

Warnings of flood stages were issued on the 2d for the lower Tennessee River, and gage heights as follows were recorded: Riverton, Ala., 26.6 feet on the 7th, or 1.6 feet above the flood stage; Johnsonville, Tenn., 25.3 feet on the 9th, or 4.3 feet above the flood stage. Warnings were also issued on the same date for the Ocmulgee and Oconee rivers of Georgia, and in due time moderate flood stages occurred in the Ocmulgee, but not in the Oconee, altho there was a decided rise. On the 3d warnings were issued for the upper James River, and on the 5th a stage of 17.2 feet, 0.8 foot below the flood stage, was reached at Columbia, Va. On the 5th warnings were issued for the flood stage of 24 feet at Camden, S. C., on the Wateree River, and by the morning of the 6th the water had reached a height of 22 feet.

There was a rapid rise in the Alabama River, of which notice was given on the 1st, but flood stages were not quite reached. There was also another in the rivers of southeastern Mississippi for which warnings were issued from the 3d to the 6th as conditions required.

The last general rise occurred from the 19th to the 23d, inclusive. It extended thru nearly all of the rivers east of the Appalachians, and also thru the New-Kanawha watershed of West Virginia. It was caused, primarily, by the heavy rains that fell from the 17th to the 19th, inclusive, and was assisted in the Carolinas by a prolongation of the rains until the 23d. The Potomac River, at Harpers Ferry, W. Va., approached to within 2 feet of the flood stage of 18 feet, altho warnings were not necessary.

The James River was generally above the flood stage, except in the immediate vicinity of Lynchburg, Va., and the first warnings for upper river points were issued on the morning of the 19th. At 6 a. m., of the 20th, warnings were issued for the lower river. These warnings were supplemented by others during the afternoon of the 20th and the morning of the 21st, and the crest stages were as follows: Buchanan, Va., 15.6 feet on the 20th, 3.6 feet above the flood stage; Lynchburg, Va., 14.6 feet on the 20th, 3.4 feet below the flood stage; Columbia, Va., 31.5 feet during the night of the 20th and 21st, 13.5 feet above the flood stage; and Richmond, Va., 18.7 feet on the 22d, 6.7 feet above the flood stage.

The Roanoke flood was more moderate, altho a stage of 35.5 feet, 5.5 feet above the flood stage, was reached on the 23d at Weldon, N. C. Warnings covering this rise were issued on the 21st.

The rise in the Pedee River was not pronounced, altho by the end of the month the stage at Smith Mills, S. C., was 13.6 feet, 2.4 feet below the flood stage. Preliminary warnings were issued on the 20th.

There was a decided flood in the Catawba–Wateree River below the North Carolina line, and on the 21st a crest stage of 28.6 feet, 4.6 feet above the flood stage, was reached at Camden, S. C. Warnings were first issued on the morning of the 19th, when the reports of the heavy rainfalls were received, and again on the 20th for a further rise to 29 feet at Camden, only 0.4 foot higher than the stage actually reached. The rise did not extend over the Congaree watershed to any appreciable extent, nor was that in the Santee of consequence. The latter river had been comparatively high thruout the month, and the late additions from the Wateree had but little effect.

No reports of serious losses or damage to property have been received, and their absence was doubtless due both to the efficiency of the Weather Bureau warnings and to the lateness of the season. Had the same floods occurred a month or two earlier, there would most certainly have been damage to crops that no warnings could have prevented.

The Ohio, Mississippi, and Missouri rivers, and those of the West, did not present any unusual features during the month.

The highest and lowest water, mean stage, and monthly range at 273 river stations are given in Table VI. Hydrographs for typical points on seven principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.

CLIMATOLOGICAL SUMMARY.

By Mr. JAMES BERRY, Chief of the Climatological Division.

TEMPERATURE AND PRECIPITATION BY SECTIONS, OCTOBER, 1906.

In the following table are given, for the various sections of the Climatological Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.							Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.					Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest. Date.			Station.	Amount.	Station.	Amount.
Alabama	61.1	— 2.7	Flomaton	90	1,4	Oneonto	25 29	3.54	+0.96	Alaga	7.96	Selma	0.10
Arizona	62.8	— 0.9	Azteo	110	1	Flagstaff	9 22	0.14	—0.51	Fort Huachuca	1.07	14 stations	0.00
			Parker	110	15								
Arkansas	58.2	— 3.5	Des Arc	94	22	3 stations	25 30,31	2.38	—0.22	Des Arc	4.08	Rogers	0.28
California	63.4	+ 2.6	Heber	110	2	Tamarack	8 20	0.09	—1.43	Monumental	3.97	Many stations	0.00
Colorado	45.5	— 1.6	Holly	91	2	Garnett	—12 24	1.66	+0.59	Salida	3.91	2 stations	0.45
Florida	71.2	— 1.6	6 stations	95	4-6	Molino	30 29	3.14	—1.18	Miami	13 68	Fenholloway	0.36
Georgia	61.7	— 2.7	Fleming	92	5	Clayton	26 29	3.70	+0.90	Covington	8.79	Valdosta	0.27
Hawaii	†75.2	.....	Tantalus, Oahu	96	7	Vol. House, Hawaii	52 2	‡4.31	.....	Makawao, Maui	16.21	Hilea, Hawaii	0.20
Idaho	49.3	+ 2.6	Murtaugh	92	11	Chesterfield	— 1 23	0.71	—0.45	Murray	3.64	2 stations	0.05
Illinois	54.1	— 0.6	New Burnside	86	23	Lanark	16 31	1.71	—0.47	Mount Carmel	4.42	Cairo	0.44
Indiana	54.1	— 0.5	Mount Vernon	89	15	Laporte	8 11	1.95	—0.44	South Bend	3.77	Salem	0.66
Iowa	50.5	— 2.0	Ames	87	13	Elkader	7 31	1.96	—0.45	Larrabee	4.25	Allerton	0.50
			Bedford	87	20								
Kansas	54.6	— 2.3	Ulysses	94	8	Coolidge	17 22	1.89	—0.18	Wakeeney (near)	5.11	Kansas City	0.23
Kentucky	56.9	— 1.2	Bardstown	91	24	Bowling Green	20 29	1.48	—0.54	Franklin	3.91	Bardstown	0.67
						Eubank	20 11						
Louisiana	64.1	— 3.6	St. Francisville	94	9	Opelousas	31 29	4.20	+1.56	Lake Charles	10.60	Covington	0.50
Maryland and Delaware	55.5	+ 0.1	Washington, D. C.	82	5	Deer Park, Md	12 12	5.09	+2.01	Porto Bello, Md	9.02	Westernport, Md	1.80
Michigan	48.2	— 0.4	Cheboygan	89	3	Humboldt	1 29	3.36	+0.61	Ludington	7.64	Ironwood	1.48
Minnesota	45.7	— 0.5	Beardsley	85	2	Angus	— 1 30	2.28	—0.15	Lynd (Rouse)	3.99	Hallock	0.45
			Pokegama Falls	85	13	Bagley	— 1 30						
Mississippi	61.5	— 3.1	Biloxi	89	21	Ripley	26 29	3.77	+1.65	Hazlehurst	6.75	Pecan	0.46
Missouri	56.3	— 1.3	Arthur	94	4	Unionville	17 31	0.87	—1.61	Jackson	2.99	Warrensburg	0.32
Montana	47.0	+ 1.8	3 stations	91	1,11	Grayling	— 9 22	0.76	—0.20	Bear Creek Cabin	6.46	3 stations	0.00
Nebraska	49.1	— 2.0	Lynch	94	7	Winnebago	7 10	2.85	+1.18	Bradshaw	5.14	Weepingwater	0.82
Nevada	50.0	+ 0.9	Logan	100	3	McAfees Ranch	1 22	0.10	—0.43	Hamilton	1.03	11 stations	0.00
New England*	50.1	+ 1.0	Hanover, N. H.	80	5	Jacksonville, Vt.	15 13	4.36	+0.30	Patten, Me.	10.10	Newton, N. H.	1.89
New Jersey	55.0	0.0	Bridgeton	80	5	Layton	11 13	4.46	+0.63	Toms River	7.14	Mahwah	2.66
			Oceanic	80	9								
New Mexico	51.7	— 1.9	Carlsbad	93	17	Elizabethtown	— 4 24	0.98	—0.15	Rociada	3.83	3 stations	0.00
						Vermejo	— 4 23						
New York	50.0	+ 0.2	3 stations	82	3 dates	Griffin Corners	17 13	4.52	+0.77	Adams Center	9.97	Oswegatchie	1.51
North Carolina	59.0	— 0.4	Marshall	92	12	Buck Spring	13 12	4.31	+0.83	Buck Spring	11.67	Chalybeate Springs	2.00
			Sloan	92	4								
North Dakota	45.0	+ 2.9	Napoleon	89	12	Grafton	0 30	0.57	—0.54	Berlin	1.67	Denbigh	0.06
						Pembina	0 30						
Ohio	52.7	— 0.8	Findlay	91	15	3 stations	18 12	3.19	+1.06	Hillhouse	8.97	New Richmond	0.95
Oklahoma and Indian Territories.	57.3	— 4.6	Pawhuska, Okla.	97	4	Hooker, Okla.	20 23	2.17	—0.11	Harrington, Okla.	4.74	Newkirk, Okla	0.78
Oregon	52.5	+ 1.5	McKenzie Bridge	92	9	Beulah	10 19	2.78	+0.39	Glenora	16.07	2 stations	T.
Pennsylvania	52.0	+ 0.2	Derry Station	87	16	Saegerstown	14 12	4.46	+1.10	Doylestown	8.39	Hyndman	1.97
Porto Rico	78.1	.....	3 stations	98	3 dates	Adjuntas	58 9,17	6.63	.....	La Carmelita (a)	15.91	Arecibo	2.19
						Corozal	58 31						
South Carolina	61.9	— 1.7	Sumter	90	1	Heath Spring	24 12	3.69	+0.61	Georgetown	12.15	Bennettsville	0.84
South Dakota	48.1	— 0.6	Cherry Creek	101	1	Stephan	9 10	2.54	+1.32	Ramsey	4.28	Ashcroft	0.30
Tennessee	57.4	— 1.8	Dover	90	23	Hohenwald	19 29	3.19	+0.66	Charleston	6.54	Union City	1.12
						Silver Lake	19 12						
Texas	62.5	— 4.6	Barstow	95	16	Nazareth	19 23	2.58	—0.21	Alvin	11.70	Texline	0.04
			Colorado	95	8								
Utah	48.4	+ 0.1	Thistle	98	1, 9	Plateau	6 23	0.34	—0.55	Ibapah (near)	2.49	4 stations	0.00
						Strawberry Valley	6 23, 24						
Virginia	55.8	— 1.4	Callaville	85	3	Burkes Garden	13 12	6.38	+3.23	Skyland	15.21	Elk Knob	2.38
			Hampton	85	15								
Washington	52.0	+ 1.8	Kosmos	91	9	Northport	6 31	3.81	+0.83	Quiniault	24.68	Trinidad	0.00
West Virginia	54.5	— 3.4	Powellton	86	23	Bayard	12 12	3.09	+0.84	Harpers Ferry	8.15	Lost Creek	1.64
Wisconsin	47.8	— 1.2	Neillsville	88	4	Koepenick	5 31	2.87	+0.42	Grand River Locks	5.25	Barron	1.20
Wyoming	42.6	0.0	Moorcroft	92	1	Soda Butte, Y. N. P.	—14 22	1.26	+0.42	Blue Cap	5.04	2 stations	0.00

*Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. †48 stations, with an average elevation of 584 feet. ‡143 stations.

THE WEATHER OF THE MONTH.

By Mr. P. C. DAY, Assistant Chief, Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure for October, 1906, over the United States and Canada is graphically shown on Chart VI, and the average values and departures from the normal are shown for each station in Tables I and V.

October, 1906, was characterized by an unusual extension northeastward of the high pressure area that normally covers the Middle Atlantic States, and the crest of high mean pressure for the month was transferred from the region of the Appalachian Mountains to the extreme eastern portions of the Canadian Maritime Provinces, where average values of 30.15 inches or above, were recorded.

From Kansas northwestward to the Pacific coast a ridge of high pressure prevailed, with average readings of 30 15 inches, or above, over the northern coast of California and the western part of Oregon.

Pressure averaged low along the northern boundary from the Great Lakes westward to the Pacific, over the south Atlantic coast and over southern California and southwestern Arizona.

The departure from the normal pressure over New England and northeastward over New Brunswick and Nova Scotia was marked, ranging from +0.10 to +0.21 inch, while along the south Atlantic coast negative departures from —0.05 to —0.10 inch prevailed. Negative departures were quite pronounced over the Canadian Northwest Provinces, while over the entire Rocky Mountain Plateau and Pacific coast region, except southern California, the pressure averaged above the normal.

Under the above-mentioned distribution of mean atmospheric pressure, the surface winds over New England, the Middle and South Atlantic, and east Gulf States were mainly from the northeast. Over the upper Missouri Valley and westward to Washington they were largely from the south, while over California northerly winds predominated.

The areas of high pressure that moved eastward across the country were generally well pronounced and moved in tracks well south of their usual course so early in the season. But few low areas crost the entire country from the Pacific and those generally originated north of the boundary and moved eastward without causing severe winds or heavy rains, except over the extreme northwestern portion of Washington.

Several storms originated over the southwest, moved northeastward to the Lakes, entered the great eastward drift and past down the St. Lawrence.

The entire section from the upper Missouri Valley westward and southwestward to the Pacific coast was remarkably free from extended disturbances.

TEMPERATURE.

The mean temperature for the month was generally above the normal over the entire region north of the fortieth parallel and over the southern Plateau and south Pacific coast. It was below normal over the Gulf States, lower Ohio and Mississippi valleys, Texas, and the southern Rocky Mountain slope.

Over Arkansas, western Oklahoma, northwestern Texas and adjacent territory the month was exceptionally cold.

Unusually cold weather accompanied the high pressure area that overspread nearly all sections of the country east of the Rocky Mountains, from the 9th to the 12th, and freezing weather, with killing frosts, was general over all sections covered as far south as the central parts of the Gulf States.

During the progress of the above cold area eastward, minimum temperatures as low or lower than ever before recorded so early in the month occurred at numerous points.

Temperatures below zero were recorded in the mountain sections of Colorado, during the passage of an area of high pressure over the Rocky Mountain region from the 22d to the 24th.

In Canada.—Prof. R. F. Stupart says:

The mean temperature of October was higher than the average in nearly all parts of the Dominion, with the largest positive departures, ranging between 3° and 5°, in the more central portions of New Brunswick and in southern Alberta and Saskatchewan.

The frosts recorded in the various provinces were not unusually severe, and in western Canada they were less pronounced than the average.

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	9	51.3	+ 1.0	+ 7.8	+ 0.8
Middle Atlantic	13	56.0	0.0	+11.8	+ 1.2
South Atlantic	10	62.5	— 0.6	+ 4.2	+ 0.4
Florida Peninsula*	8	73.1	— 0.2	+ 0.6	+ 0.1
East Gulf	8	62.7	— 3.1	— 6.6	— 0.7
West Gulf	7	63.6	— 3.5	— 4.8	— 0.5
Ohio Valley and Tennessee	12	55.8	— 0.7	+ 3.4	+ 0.3
Lower Lake	8	51.2	— 0.1	+13.4	+ 1.3
Upper Lake	10	47.9	+ 0.7	+19.5	+ 2.0
North Dakota*	8	45.4	+ 2.3	+22.3	+ 2.2
Upper Mississippi Valley	13	52.1	— 0.4	+ 7.1	+ 0.7
Missouri Valley	11	51.9	— 0.6	+ 9.8	+ 1.0
Northern Slope	7	47.1	+ 1.0	+10.3	+ 1.0
Middle Slope	6	52.6	— 2.7	— 1.4	— 0.1
Southern Slope*	6	55.8	— 5.6	—14.9	— 1.5
Southern Plateau*	13	58.3	+ 0.2	+ 0.1	0.0
Middle Plateau*	8	48.7	+ 0.3	— 0.9	— 0.1
Northern Plateau*	12	50.7	+ 2.7	+17.9	+ 1.8
North Pacific	7	53.3	+ 1.9	+13.6	+ 1.4
Middle Pacific	5	61.1	+ 3.0	+12.5	+ 1.2
South Pacific	4	66.1	+ 2.7	+ 9.5	+ 1.0

* Regular Weather Bureau and selected cooperative stations.

PRECIPITATION.

Over the greater part of New England, the Atlantic and Gulf coast districts, the Lake region, and the central Rocky Mountain and Great Plains regions, the monthly rainfall was above the average. Over the Appalachian Mountain region the rainfall was unusually heavy, and in parts of Virginia and Maryland rainfall was almost continuous from the 16th to the 21st.

Heavy rains occurred over eastern Texas on the 13th and 14th, accompanying a slight depression of the barometer in that section on those dates. The fall at Galveston amounted to nearly 8.00 inches in twenty-four hours. Rain turning into heavy snow occurred over the central Rocky Mountain region from the 19th to the 23d. The snowfall during the above period over the eastern sections of Colorado and Wyoming and western Nebraska was remarkably heavy for the season, the depth of fall in the mountain sections reaching as much as three feet and exceeding any previous record of snowfall for October.

Over the Mississippi Valley, western Texas, and generally west of the Rocky Mountains the rainfall was deficient. Over California and western Arizona the month was abnormally dry. Practically no rain occurred over the entire southern part of California and western Arizona. Over the northwestern part of Washington there was a general excess of precipitation with remarkably heavy falls at a few stations. Much cloudy weather prevailed over the Middle and South Atlantic States, but elsewhere the month was one of abundant sunshine and generally favorable for the successful prosecution of the usual outdoor occupations.

In Canada.—Professor Stupart says:

The precipitation was in excess of the normal in British Columbia, in Ontario east of Lake Superior, and in Quebec, while in the Western Provinces and in the Maritime Provinces there was a deficiency. The excess near the Pacific coast appears to have been most pronounced on Vancouver Island and on the upper mainland, with more average conditions on the lower mainland. In Ontario the excess was almost general and probably averaged about one-third more than the normal; in Quebec the normal was only slightly exceeded in western districts and was not reached in the eastern portion; in Nova Scotia and New Brunswick the

deficiency was small. Heavy local snowfalls occurred on the highlands of central Ontario on or about the 10th, and a light fall occurred in southern Ontario on the 29th. In other parts of Canada the snow recorded, if any, was little beyond a flurry.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	9	3.68	97	−0.1	−1.1
Middle Atlantic	13	4.19	156	+1.5	+1.9
South Atlantic	10	3.34	89	−0.4	−1.8
Florida Peninsula*	8	3.18	67	−1.6	+4.4
East Gulf	8	3.33	122	+0.6	+2.4
West Gulf	7	3.59	120	+0.6	−6.7
Ohio Valley and Tennessee	12	2.20	88	−0.3	−4.1
Lower Lake	8	5.38	175	+2.3	−1.8
Upper Lake	10	2.99	100	0.0	−2.2
North Dakota*	8	0.41	41	−0.6	+1.4
Upper Mississippi Valley	13	1.49	62	−0.9	−1.4
Missouri Valley	11	2.08	111	+0.2	+1.1
Northern Slope	7	1.46	170	+0.6	+2.7
Middle Slope	6	1.78	113	+0.2	+2.2
Southern Slope*	6	1.84	95	−0.1	+3.9
Southern Plateau*	13	0.30	43	−0.4	+2.7
Middle Plateau*	8	0.29	38	−0.6	+3.8
Northern Plateau*	12	0.63	51	−0.6	−0.9
North Pacific	7	4.52	100	0.0	−6.9
Middle Pacific	5	0.14	8	−1.6	+2.5
South Pacific	4	0.01	2	−0.6	+5.8

* Regular Weather Bureau and selected cooperative stations.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	6.0	+ 0.5	Missouri Valley	4.8	+ 0.9
Middle Atlantic	6.7	+ 1.9	Northern Slope	4.7	+ 0.5
South Atlantic	5.2	+ 0.4	Middle Slope	4.0	+ 0.9
Florida Peninsula	4.4	− 0.3	Southern Slope	3.7	+ 0.9
East Gulf	4.7	+ 1.1	Southern Plateau	1.8	− 0.2
West Gulf	4.0	+ 0.4	Middle Plateau	2.7	− 0.5
Ohio Valley and Tennessee	5.5	+ 1.0	Northern Plateau	4.8	− 0.3
Lower Lake	6.6	+ 0.8	North Pacific	6.9	+ 1.0
Upper Lake	6.6	+ 0.5	Middle Pacific	2.8	− 0.4
North Dakota	5.3	+ 0.2	South Pacific	1.7	− 1.3
Upper Mississippi Valley	5.7	+ 1.3			

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	80	+ 1	Missouri Valley	66	− 1
Middle Atlantic	79	+ 3	Northern Slope	66	+ 7
South Atlantic	78	0	Middle Slope	66	+ 7
Florida Peninsula	81	+ 1	Southern Slope	71	+ 9
East Gulf	76	+ 3	Southern Plateau	42	− 1
West Gulf	72	0	Middle Plateau	45	0
Ohio Valley and Tennessee	73	+ 2	Northern Plateau	55	− 8
Lower Lake	80	+ 6	North Pacific	82	+ 2
Upper Lake	79	+ 1	Middle Pacific	54	−11
North Dakota	72	+ 2	South Pacific	56	−14
Upper Mississippi Valley	71	0			

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Bismarck, N. Dak	28	60	nw.	Mount Tamalpais, Cal	19	50	n.
Do	29	54	nw.	Do	20	54	n.
Block Island, R. I.	6	50	nw.	Do	21	51	n.
Do	31	51	n.	Mount Weather, Va	6	54	nw.
Buffalo, N. Y	8	51	sw.	Do	7	50	nw.
Do	9	50	sw.	Do	9	54	nw.
Do	25	60	sw.	Do	27	66	nw.
Do	27	63	sw.	Nantucket, Mass	31	60	ne.
Do	28	75	sw.	New York, N. Y	6	50	nw.
Burlington, Vt	9	54	s.	Do	7	58	nw.
Cape Henry, Va	9	52	n.	North Head, Wash	2	70	se.
Canton, N. Y.	25	55	sw.	Do	11	62	se.
Charleston, S. C.	20	64	n.	Do	15	67	se.
Chicago, Ill	27	50	nw.	Do	16	57	s.
Cleveland, Ohio	6	55	w.	Do	25	53	s.
Do	7	54	w.	Point Reyes Light, Cal	2	50	nw
Do	8	50	w.	Do	3	50	nw.
Do	27	60	w.	Do	12	66	nw.
Do	28	52	w.	Do	16	62	nw.
Duluth, Minn	27	50	nw.	Do	17	70	nw.
El Paso, Tex	5	52	ne.	Do	18	71	nw.
Do	13	50	ne.	Do	19	50	n.
Hatteras, N. C.	6	52	nw.	St. Louis, Mo	27	60	nw.
Do	15	50	n.	Salt Lake City, Utah	21	52	ne.
Jupiter, Fla	18	60	ne.	Sand Key, Fla	17	54	ne.
Key West, Fla	18	54	nw.	Do	18	75	nw.
Lincoln, Nebr	26	54	nw.	Santa Fe, N. Mex	21	53	se.
Mount Tamalpais, Cal	2	72	nw.	Southeast Farallon, Cal	17	50	nw.
Do	3	50	nw.	Do	18	58	nw.
Do	10	54	nw.	Syracuse, N. Y	8	50	s.
Do	11	60	nw.	Tatoosh Island, Wash	24	56	s.
Do	15	50	nw.	Do	25	57	s.
Do	16	53	nw.	Toledo, Ohio	8	56	sw.
Do	17	50	nw.				

DESCRIPTION OF TABLES AND CHARTS.

By Mr. P. C. DAY, Assistant Chief, Division of Meteorological Records.

For description of tables and charts see page 38 of REVIEW for January, 1906.

TABLE I.—*Climatological data for U. S. Weather Bureau stations, October, 1906.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.								Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness during daylight, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.				
New England.							51.5	+ 1.0									80	3.68	— 0.1									6.0	
Eastport	76	69	85	30.02	30.10	+ .10	48.8	+ 2.0	63	10	55	33	31	43	22	46	42	81	3.64	— 0.4	10	7,667	s.	48	se.	25	10	10	11	5.6	2.5
Portland, Me.	103	81	117	29.98	30.10	+ .06	48.4	— 0.7	62	9	55	32	31	42	23	45	42	80	2.75	— 1.2	14	6,537	w.	40	se.	9	10	7	14	5.8	0.9
Concord	288	70	79	29.78	30.09	+ .04	49.0	— 0.5	73	5	59	24	13	39	39	....	....	....	3.60	+ 0.1	8	3,315	se.	24	w.	7	11	8	15	5.9	
Burlington	404	12	47	29.63	30.07	+ .05	48.0	— 1.7	75	15	57	28	13	39	35	....	....	....	2.93	+ 0.2	12	8,466	s.	54	s.	9	11	5	15	5.6	0.8
Northfield	876	16	70	29.13	30.10	+ .06	45.6	+ 2.3	74	5	57	21	13	34	41	41	39	84	3.16	+ 0.9	12	5,879	s.	40	se.	9	10	8	13	6.1	1.0
Boston	125	115	188	29.95	30.09	+ .04	52.5	+ 0.6	73	25	59	35	13	46	24	49	45	78	3.88	— 0.4	9	6,955	w.	35	s.	9	8	10	13	6.2	
Nantucket	12	14	90	30.05	30.06	+ .01	55.2	+ 2.6	72	20	60	40	12	50	18	52	49	83	2.33	— 1.6	10	13,264	ne.	60	ne.	31	8	14	9	6.0	
Block Island	26	11	46	30.04	30.07	+ .02	55.0	+ 1.4	68	5	60	40	31	50	16	52	48	81	2.69	— 1.7	9	14,342	ne.	51	n.	31	8	13	13	6.2	
Narragansett	....	9	....	....	....	....	53.6	+ 1.3	72	5	61	32	30	46	26	....	....	....	4.40	— 0.4	9	.....	ne.	....	.....	..	14	8	12	....	
Providence	160	57	67	29.91	30.09	+ .04	53.2	+ 0.8	73	5	62	33	14	45	28	48	45	79	4.91	.....	8	5,054	ne.	24	w.	29	9	10	12	5.8	
Hartford	159	122	132	29.90	30.08	+ .02	53.0	+ 2.7	77	5	62	28	13	44	34	48	44	78	5.54	.....	8	4,959	n.	36	s.	9	3	12	16	7.4	
New Haven	106	116	155	29.96	30.07	+ .01	53.7	+ 1.3	73	5	62	31	13	45	31	48	45	76	7.44	+ 3.4	6	7,646	ne.	36	s.	25	10	12	9	5.5	
Mid. Atlantic States.							56.0	0.0									79	4.19	+ 1.5									6.7	
Albany	97	102	115	29.98	30.08	+ .02	52.0	+ 1.4	76	5	61	29	13	43	35	47	43	78	2.62	— 0.6	12	5,254	s.	35	s.	9	6	10	15	6.6	T.
Binghamton	875	79	90	29.12	30.06	.00	50.0	+ 0.4	76	16	59	25	13	42	37	....	....	....	3.07	0.0	15	4,521	w.	30	sw.	25	5	5	21	7.8	0.6
New York	314	108	350	29.72	30.06	.00	56.1	+ 1.1	74	9	62	37	12	50	26	51	47	78	4.30	+ 0.8	11	10,490	ne.	58	nw.	7	5	10	16	7.0	T.
Harrisburg	374	94	104	29.68	30.08	.00	53.6	+ 1.1	75	5	60	33	13	47	33	48	44	77	4.07	+ 1.0	12	5,592	e.	36	w.	27	7	5	19	7.0	
Philadelphia	117	116	184	29.94	30.07	.00	56.2	+ 0.4	75	5	63	36	31	50	24	51	46	71	4.97	+ 2.1	14	8,862	ne.	36	sw.	9	6	8	17	7.2	T.
Scranton	805	111	119	29.20	30.06	— .01	52.1	.....	75	5	60	29	13	44	35	47	44	79	3.71	.....	17	4,814	**ne.**	40	w.	27	5	5	21	7.2	T.
Atlantic City	52	37	48	29.99	30.05	— .02	56.8	+ 0.5	72	5	62	33	12	52	22	53	50	79	6.22	+ 2.9	13	8,535	ne.	31	ne.	15	7	5	19	7.0	
Cape May	17	48	52	30.04	30.06	— .01	57.7	— 1.2	74	5	63	37	31	53	21	54	....	....	2.94	— 0.6	13	8,528	ne.	34	w.	6	7	11	13	6.6	
Baltimore	123	69	117	29.92	30.05	— .03	56.2	— 0.7	80	5	64	33	12	49	33	51	46	73	5.74	+ 2.8	14	6,823	ne.	36	w.	6	8	7	16	6.7	
Washington	112	59	76	29.93	30.06	— .02	56.9	+ 0.7	82	5	65	31	12	48	37	51	48	80	5.71	+ 2.6	16	4,715	ne.	34	nw.	6	9	6	16	6.5	
Cape Henry	18	11	58	29.99	30.01	— .06	62.7	+ 0.9	84	6	68	40	11	57	27	....	....	....	2.80	— 1.0	14	14,742	ne.	52	n.	9	6	8	17	6.7	
Lynchburg	681	83	88	29.31	30.06	— .03	55.4	— 1.7	81	5	64	27	12	47	42	51	48	84	7.15	+ 3.9	15	3,569	ne.	24	nw.	6	9	9	13	6.3	
Mount Weather	1,725	10	57	28.28	30.07	— .02	49.7	.....	73	5	57	28	12	43	29	46	43	82	11.83	.....	18	12,667	nw.	66	nw.	27	9	5	17	6.5	T.
Norfolk	91	102	111	29.92	30.02	— .05	61.5	+ 0.9	82	6	67	37	11	56	25	58	56	85	4.69	+ 0.8	16	8,572	ne.	31	ne.	17	10	5	16	6.0	
Richmond	144	145	153	29.90	30.05	— .03	57.8	— 2.0	82	5	65	34	11	50	32	....	....	....	7.47	+ 4.2	15	7,254	n.	36	w.	6	10	6	15	6.2	
Wytheville	2,293	40	47	27.67	30.06	— .08	51.8	— 1.6	73	28	61	21	12	43	40	46	44	82	4.97	+ 2.2	13	4,063	e.	35	w.	27	10	8	16	5.9	T.
S. Atlantic States.							62.5	— 0.6									78	3.34	— 0.4									5.2	
Asheville	2,255	53	75	27.69	30.06	— .03	53.7	— 0.9	78	22	63	24	12	44	36	48	46	84	3.44	+ 0.7	8	6,233	nw.	33	nw.	6	11	11	9	4.8	T.
Charlotte	773	68	76	29.20	30.04	— .04	57.8	— 2.5	80	6	66	31	12	50	31	52	48	75	4.17	+ 0.5	9	6,111	ne.	30	sw.	6	14	3	14	5.3	
Hatteras	11	12	47	29.96	29.97	— .09	66.8	+ 2.3	84	6	72	45	31	62	24	62	60	81	6.25	+ 0.1	14	12,354	ne.	52	nw.	6	11	10	10	4.9	
Raleigh	376	71	79	29.62	30.02	— .05	59.2	+ 1.2	82	6	67	31	12	51	31	54	50	77	2.63	— 0.7	14	6,050	n.	28	nw.	6	11	6	14	5.6	
Wilmington	78	81	91	29.88	29.97	— .09	64.5	+ 1.0	85	6	72	35	12	56	25	59	56	80	4.75	+ 0.9	9	6,535	ne.	38	ne.	20	12	8	11	5.2	
Charleston	48	14	92	29.92	29.98	— .08	66.2	— 0.5	84	6	73	44	11	60	20	60	56	76	4.67	+ 0.5	7	9,797	n.	64	n.	20	11	8	12	5.1	
Columbia, S. C.	351	41	57	29.63	30.01	— .06	61.4	— 2.2	84	5	70	34	29	52	31	55	51	75	1.80	— 0.6	8	5,944	ne.	36	ne.	20	15	3	13	5.1	
Augusta	180	89	97	29.82	30.01	— .06	61.8	— 1.9	82	5	71	34	29	53	32	56	52	78	1.26	— 1.2	6	5,653	ne.	34	n.	20	12	6	13	5.3	
Savannah	65	81	89	29.92	29.99	— .06	65.5	— 0.9	86	3	73	40	29	58	23	59	55	76	2.01	— 1.6	10	6,017	n.	42	n.	20	11	7	13	5.6	
Jacksonville	43	101	129	29.90	29.95	— .07	68.2	— 1.5	89	5	75	44	29	61	22	62	59	77	2.39	— 2.8	9	7,582	ne.	33	sw.	6	7	12	12	5.5	
Florida Peninsula.							76.3	+ 0.6									81	4.48	— 1.7									4.4	
Jupiter	23	10	48	29.88	29.91	— .05	76.4	+ 1.0	91	6	82	60	18	70	18	72	70	84	8.31	— 1.3	17	8,450	ne.	60	ne.	18	3	25	3	5.2	
Key West	22	10	53	29.88	29.90	— .04	79.6	+ 1.1	89	3	84	70	29	75	12	73	71	79	4.53	— 0.7	19	7,912	ne.	54	nw.	18	12	15	4	4.6	
Sand Key	25	41	71	29.85	29.88	— .06	78.8	.....	91	7	82	69	12	76	14	....	....	....	3.05	.....	10	11,774	ne.	75	nw.	18	17	13	1	3.9	
Tampa	35	79	96	29.89	29.93	— .05	73.0	— 0.1	88	4	81	49	11	65	28	66	64	79	0.59	— 3.1	5	6,458	ne.	31	ne.	18	16	11	4	3.9	
East Gulf States.							62.7	— 3.1									76	3.33	+ 0.6									4.7	
Atlanta	1,174	190	216	28.79	30.03	— .04	58.6	— 3.6	77	22	67	31	11	50	27	52	47	72	5.13	+ 2.8	8	9,539	nw.	38	nw.	19	15	5	11	4.7	
Macon	370	55	66	29.62	30.02	— .04	62.0	— 3.6	82	5	71	34	29	53	33	....	....	....	3.15	+ 1.3	5	4,030	ne.	22	ne.	21	10	10	11	5.6	
Thomasville	273	8	57	29.70	29.99	— .05	64.6	— 4.8	86	3	75	36	29	54	34	58	55	80	4.06	+ 0.7	7	3,986	ne.	18	sw.	2	14	9	8	4.4	
Pensacola	56	79	96	29.95	30.01	— .02	66.4	— 2.8	82	4	74	46	11	59	25	....	....	....	3.83	+ 0.5	3	7,457	ne.	33	sw.	5	13	8	10	4.6	
Anniston	741	9	58	29.26	30.06	— .01	59.2	— 3.3	80	22	71	28	29	48	36	....	....	....	3.02	+ 0.4	6	3,688	se.	19	nw.	27	14	4	13	5.1	
Birmingham	700	136	144	29.29	30.06	— .01	60.8	— 4.3	80	21	69	35	11	52	27	54	50	74	3.48	+ 0.5	5	5,532	e.	26	se.	5	11	9	11	5.4	
Mobile	57	98	106	29.94	30.00	— .04	65.8	— 1.6	83	21	74	46	29	57	27	59	55	74	3.81	+ 0.4	4	5,581	nw.	30	s.	5	16	7	8	4.1	
Montgomery	223	100	112	29.79	30.04	— .02	62.4	— 2.8	80	21	72	35	29	53	31	55	51	75	1.73	— 0.6	6	4,713	e.	24	e.	14	14	9	8	4.2	
Meridian	375	84	93	29.64	30.04	— .02	60.5	— 1.7	81	21	71	33	29	50	33	54	51	79	3.14	+ 1.5	6	3,706	ne.	22	e.	1	15	8	8	4.4	
Vicksburg	247	62	74	29.77	30.05	— .01	62.1	— 3.2	83	22	71	41	29	53	29	55	52	78	4.23	+ 1.6	7	4,600	n.	20	e.	15	16	6	9	4.5	
New Orleans	51	88	121	29.95	30.00	— .03	67.5	— 2.3	83	4	74	49	11	61	20	61	58	76	1.08	— 2.1	5	6,388	n.	30	se.	5	11	8	12	5.2	
West Gulf States.							63.6	— 3.5									72	3.59	+ 0.6									4.6	
Shreveport	249	77	84	29.77	30.05	.00	61.4	— 3.9	83	22	71	40	31	52	30	54	50	74	2.78	— 0.3	8	4,729	n.	23	se.	14	17	4	10	4.5	
Bentonville	1,303	11	44	28.62	30.02	— .03	55.2	.....	82	4	67	30	10	44	37	....	....	....	1.51	.....	5	4,050	s.	20	s.	12	19	2	10	4.6	
Fort Smith	457	79	94	29.56	30.04	— .01	58.0	— 3.1	84	4	70	34	31	46	40	50	44	69	1.07	— 1.8	6	5,789	e.	46	nw.	27	17	8	6	3.5	
Little Rock	357	93	100	29.68	30.05	— .01	59.4	— 2.9	83	23	68	38	11	50	32	52	47	71	3.21	+ 0.7	5	5,523	nw.	35	**nw.**	27	15	6	10	4.3	
Corpus Christi	20	48	53	29.98	30.00	.00	70.8	— 1.7	83	14	78	52	31	64	25	63	60	74	3.84	+ 1.6	4	6,428	n.	26	n.	10	16	10	5	3.5	
Fort Worth	670	106	114	29.32	30.03	.00	61.4	— 5.5	86	3	73	34	31	50	34	....	....	....	0.01	— 2.1	4	7,484	sw.	29	s.	29	17	10	4	3.3	
Galveston	54	106	112	29.96	30.02	— .01	69.0	— 3.3	82	18	74	52	31	64	15	65	63	84	10.88	+ 6.6	7	8,240	n.	48	se.	14	11	13	7	4.9	
Palestine	510	73	79	29.49	30.02	— .01	62.6	— 3.9	82	22	72	42	31	53	29	54	49	70	3.93	+ 0.7	5	5,148	ne.	22	ne.	27	16	3	12	4.4	
San Antonio	701	80	91	29.27	30.00	— .01	66.1	— 3.6	88	2	78	43	25	54	36	56	49	61	1.09	— 0.6	5	4,951	n.	26	n.	27	18	6	7	3.4	
Taylor	583	55	63	29.40	30.02	.00	63.6	.. ....	87	3	76	40	24	51	38	....	....	....	1.10	.....	5	5,643	nw.	23	n.	27	17	8	6	3.8	
Ohio Val. and Tenn.							55.8	— 0.7									73	2.30	— 0.3									5.5	
Chattanooga	762	106	112	29.25	30.07	— .02	58.9	— 1.6	81	22	69	31	29	49	37	52	47	72	4.59	+ 1.9	9	4,937	ne.	36	w.	27	16	7	8	4.2	
Knoxville	1,004	35	88	28.99	30.05	— .04	57.2	— 0.4	80	22	67	28	11	47	34	51	47	75	2.38	— 0.4	8	5,986	sw.	35	w.	27	15	6	10	4.8	
Memphis	399	76	97	29.64	30.07	.00	59.6	— 2.0	81	23	67	38	31	52	28	52	46	67	1.99	— 0.8	6	6,766	n.	48	nw.	27	19	2	10	3.8	
Nashville	546	79	91	29.48	30.07	— .01	58.4	— 1.2	84	23	68	29	29	48	35	51	46	70	2.28	— 0.2	8	4,251	sw.	26	w.	27	12	11	8	4.7	
Lexington	989	75	102	28.98	30.05	— .03	54.7	— 1.1	81	23	64	26	11	46	27	....	....	....	0.74	— 1.5	8	8,538	ne.	50	w.	27	14	5	12	5.1	T.
Louisville	525	111	132	29.48	30.08	.00	57.4	— 0.3	79	22	67	30	11	48	32	50	44	68	0.99	— 1.8	7	7,015	n.	46	sw.	27	13	7	11	5.1	T.
Evansville	431	72	82	29.56	30.03	— .05	57.9	.....	82	23	67	31	31	49	28	....	....	....	1.88	.....	7	5,666	ne.	32	sw.	8	10	12	9	5.1	
Indianapolis	822	154	164	29.15	30.04	— .03	54.0	— 0.4	76	16	62	26	11	45	27	48	43	72	1.17	— 1.6	9	8,078	ne.	44	sw.	8	10	8	13	5.8	T.
Cincinnati	628	152	160	29.38	30.06	— .02	56.2	— 0.2	77	17	65	28	11	47	28	49	43	67	1.06	— 1.4	9	5,780	ne.	36	w.	27	10	8	13	5.8	T.
Columbus	824	173	190	29.17	30.05	— .03	53.0	— 0.7	75	8	62	28	11	44	30	47	42	74	2.07	— 0.6	13	9,858	se.	48	w.	27	11	4	16	6.0	0.2
Pittsburg	842	336	352	29.14	30.05	— .03	53.4	— 1.3	78	24	62	28	11	44	34	48	45	79	2.94	+ 0.5	15	8,019	ne.	48	w.	27	5	7	19	7.2	T.
Parkersburg	638	77	84	29.40	30.06	— .02	54.9	— 0.2	78	24	64	26	12	46	38	48	44	75	2.40	+ 0.3	16	4,696	n.	31	w.	27	6	8	17	7.1	T.
Elkins	1,940	41	50	28.01	30.08	— .02	52.2	+ 1.5	76	23	62	16	12	42	40	45	42	82	3.81	+ 1.8	14	3,206	w.	27	nw.	6	9	6	16	6.5	4.9
Lower Lake Region.							51.2	— 0.1									80	5.38	+ 2.3									6.6	
Buffalo	767	178	206	29.19	30.02	— .03	51.2	+ 0.9	75	16	58	29	31	44	28	48	46	89	7.57	+ 3.9	17	10,578	s.	75	sw.	28	5	10	16	7.1	4.4
Canton	448	10	71	29.55	30.04	.....	47.4	.....	77	4	57	25	31	38	34	....	....	....	5.32	.....	12	7,872	sw.	55	sw.	25	10	7	14	5.6	0.2
Oswego	335	76	91	29.67	30.04	— .01	50.2	+ 0.2	76	5	58	31	31	42	25	47	44	83	5.99	+ 2.7	16	8,396	s.	36	n.	6	8	5	18	6.5	1.4
Rochester	523	81	102	29.47	30.05	.00	50.8	+ 1.2	78	5	59	32	31	43	31	46	42	80	6.02	+ 3.1	17	5,807	sw.	40	sw.	28	7	6	18	7.0	5.0
Syracuse	597	97	113	29.40	30.04	— .02	50.8	.....	75	5	59	29	31	43	27	....	....	....	3.84	.....	17	8,306	s.	51	sw.	27	6	11	14	6.5	4.5
Erie	713	92	102	29.25	30.03	— .02	51.8	— 0.4	77	5	59	32	31	44	32	46	42	76	6.33	+ 2.2	14	10,171	se.	41	s.	27	4	9	18	7.3	1.0
Cleveland	762	190	201	29.21	30.03	— .03	51.8	— 0.4	74	5	59	32	10	45	31	47	43	75	5.73	+ 2.9	15	14,192	se.	60	w.	27	6	7	18	7.3	6.2
Sandusky	629	62	70	29.33	30.02	— .04	52.0	— 1.2	76	8	59	30	12	45	33	....	....	....	3.81	+ 1.0	15	7,481	sw.	38	w.	27	6	8	17	6.5	T.
Toledo	628	207	246	29.35	30.04	— .01	50.9	— 1.2	76	8	59	24	11	43	32	46	43	77	3.39	+ 1.0	13	11,928	nw.	60	w.	27	11	8	12	5.9	0.4
Detroit	730	153	195	29.23	30.03	— .02	51.0	0.0	74	8	58	25	11	44	27	46	43	77	4.20	+ 1.7	13	9,286	sw.	40	nw.	28	9	8	14	6.2	T.
Upper Lake Region.							47.9	+ 0.7									79	2.99	0.0									6.6	
Alpena	609	13	92	29.35	30.02	— .01	45.9	+ 0.7	71	15	54	24	31	38	32	42	40	82	2.96	— 0.8	13	8,405	nw.	40	s.	8	11	6	14	5.9	1.4
Escanaba	612	40	82	29.35	30.02	+ .01	45.7	+ 1.0	68	3	53	20	11	38	25	42	38	79	2.95	— 0.4	12	7,600	s.	35	nw.	9	9	12	10	5.5	2.1
Grand Haven	632	54	92	29.32	30.01	— 02	49.4	— 0.2	75	3	58	25	31	41	29	44	41	78	3.27	0.0	14	8,559	se.	47	w.	7	4	11	16	6.9	3.5

TABLE I.—*Climatological data for U. S. Weather Bureau stations, October, 1906*—Continued.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.								Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness during daylight, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.			Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.				
Up. Lake Reg—Con't.																												
Grand Rapids	707	121	162	29.25	30.02	— .02	50.2	— 0.6	76	2	59	25	11	42	33	44	41	77	2.94	+ 0.3	13	7,690	nw.	37	w.	7	6	8	17	6.6	2.6
Houghton	668	66	74	29.26	29.99	— .01	46.0	.....	83	3	53	21	31	39	30	....	....	....	3.68	.....	14	4,977	e.	30	w.	8	6	9	16	6.9	4.5
Marquette	734	77	116	29.20	30.01	— .00	46.8	+ 1.7	82	3	54	24	29	40	26	41	37	74	3.70	+ 0.4	17	8,165	s.	40	nw.	27	3	9	19	7.5	14.2
Port Huron	638	70	120	29.32	30.02	— .02	49.5	+ 0.6	72	14	57	26	31	42	29	45	42	79	5.21	+ 2.4	15	9,233	s.	46	nw.	27	7	10	14	6.4	12.6
Sault Ste. Marie	614	40	61	29.32	30.03	+ .02	45.2	+ 2.5	76	3	52	22	31	38	33	41	38	84	2.79	— 0.7	10	6,894	se.	38	nw.	28	1	12	18	7.7	1.0
Chicago	823	140	310	29.14	30.03	— .01	52.8	+ 0.8	75	8	59	27	11	47	30	48	44	75	2.05	— 0.9	7	11,662	nw.	50	nw.	27	5	11	15	6.4	T.
Milwaukee	681	122	142	29.29	30.03	.00	51.0	+ 1.8	74	13	57	25	11	45	24	47	45	84	2.05	— 0.3	7	8,252	nw.	42	e.	23	8	6	17	6.2	0.6
Green Bay	617	49	86	29.33	30.00	— .02	48.1	+ 1.2	79	3	57	21	11	39	31	42	38	75	2.68	0.0	10	7,609	s.	46	n.	29	7	5	19	6.7	1.5
Duluth	1,133	11	47	28.76	30.00	.00	42.1	— 1.7	77	3	49	13	30	35	27	38	35	82	2.34	— 0.2	10	9,393	ne.	50	nw.	27	6	11	14	6.0	2.5
North Dakota.							45.5	+ 2.2										72	0.55	— 0.3									5.3	
Moorhead	940	8	57	28.97	30.00	.00	44.0	+ 0.9	81	3	54	14	22	34	35	38	36	81	1.06	— 0.9	9	6,967	s.	37	nw.	8	12	11	8	4.5	4.4
Bismarck	1,674	15	57	28.21	30.02	+ .03	46.9	+ 3.1	88	12	61	13	10	33	50	38	32	66	0.32	— 0.7	3	8,146	nw.	60	nw.	28	15	11	5	4.7	
Devils Lake	1,482	11	44	28.38	29.98	— .01	42.4	.....	88	12	56	5	30	28	50	35	31	76	0.10	.....	4	9,005	nw.	47	nw.	8	9	8	14	5.9	T.
Williston	1,875	14	44	27.97	29.97	— .01	45.7	+ 2.5	83	11	59	16	10	35	50	37	30	64	0.26	— 0.7	5	6,826	nw.	43	nw.	28	7	11	13	6.2	
Upper Miss. Valley.							52.1	— 0.4										71	1.43	— 0.9									5.7	
Minneapolis	.....	102	208	.....	.....	.....	47.8	— 0.1	77	3	56	24	30	40	29	....	....	...	1.93	+ 0.1	7	9,637	se.	44	nw.	8	10	4	17	6.3	T.
St. Paul	837	171	179	29.08	29.99	— .02	47.8	+ 0.7	77	3	56	25	31	40	32	42	38	73	1.91	0.0	8	7,793	se.	46	nw.	8	8	7	16	6.7	0.3
La Crosse	714	71	87	29.22	30.00	— .02	49.7	+ 0.2	78	4	58	24	31	41	30	....	....	...	1.90	— 0.3	10	5,698	s.	38	nw.	8	9	7	15	6.2	T.
Madison	974	70	78	28.95	30.01	— .02	49.6	— 0.8	74	3	58	26	11	42	29	43	38	72	2.69	+ 0.2	8	7,600	s.	40	n.	29	8	6	17	6.0	0.4
Charles City	1,015	8	58	28.93	30.02	.00	48.2	— 3.4	78	4	59	22	31	38	38	42	39	80	1.87	— 0.5	9	5,693	nw.	36	nw.	8	8	8	15	6.1	T.
Davenport	606	71	79	29.36	30.02	— .02	52.6	+ 0.5	78	3	62	27	10	43	31	45	40	69	1.67	— 1.0	9	5,738	nw.	33	nw.	27	11	9	11	5.3	T.
Des Moines	861	84	101	29.12	30.03	.00	51.6	— 0.6	80	4	62	24	31	41	37	44	37	65	1.18	— 1.9	5	5,932	nw.	31	nw.	26	10	7	14	5.7	
Dubuque	698	100	117	29.28	30.04	.00	50.8	+ 0.2	77	4	60	23	31	41	33	43	38	69	1.70	— 1.0	9	4,087	se.	13	nw.	4	7	9	15	6.2	T.
Keokuk	614	64	77	29.36	30.04	— .01	54.3	+ 0.2	80	4	64	26	31	45	34	46	41	71	0.73	— 2.0	3	5,205	nw.	30	sw.	24	10	11	10	4.9	
Cairo	356	87	93	29.67	30.06	— .01	58.2	— 0.5	81	23	67	34	31	50	25	51	47	75	0.44	— 2.3	6	6,830	s.	36	**nw.**	27	11	10	10	5.1	
La Salle	536	56	64	29.46	30.03	— .01	52.2	.....	77	3	62	25	31	42	32	....	....	....	1.12	.....	7	6,130	w.	32	w.	27	11	6	14	5.7	T.
Peoria	609	11	45	29.37	30.04	— .01	52.8	.....	77	8	63	22	31	42	32	45	40	71	1.00	.....	5	6,653	nw.	36	sw.	24	10	9	12	5.4	T.
Springfield, Ill.	644	10	92	29.34	30.03	— .02	54.8	— 0.7	80	4	65	26	31	45	31	46	41	67	1.46	— 1.2	8	7,003	nw.	38	nw.	27	9	10	12	5.6	
Hannibal	534	75	109	29.45	30.02	— .03	54.8	— 0.7	82	4	65	26	11	45	33	....	....	....	0.61	— 0.8	5	6,785	sw.	42	**nw.**	27	13	5	13	5.1	
St. Louis	567	208	217	29.42	30.03	— .03	56.9	— 0.6	81	4	66	30	31	48	29	50	45	68	1.25	— 1.6	7	7,766	ne.	60	nw.	27	9	14	8	5.0	
Missouri Valley.							51.9	— 0.6										66	2.03	+ 0.2									4.8	
Columbia, Mo	784	11	84	29.17	30.04	— .01	55.5	— 2.1	86	4	67	28	31	44	35	....	....	....	0.40	— 1.7	5	6,185	sw.	48	nw.	27	19	6	6	3.6	
Kansas City	963	78	95	29.03	30.07	— .03	58.6	+ 0.9	88	7	67	32	10	47	35	46	38	58	0.23	— 3.2	4	5,907	nw.	43	nw.	26	15	7	9	3.8	
Springfield, Mo	1,324	98	104	28.63	30.04	— .01	54.9	— 1.1	83	4	64	29	10	45	32	47	41	69	0.89	— 2.2	6	7,902	se.	35	nw.	27	16	6	9	3.8	
Iola	984	40	47	28.99	30.04	.00	55.4	.....	86	4	67	28	10	44	38	....	....	....	0.74	.....	4	5,730	sw.	34	nw.	26	13	10	8	4.8	
Topeka	.....	85	89	.....	.....	.....	55.6	— 0.4	88	7	67	28	10	44	38	....	....	....	0.33	— 1.7	3	6,229	nw.	36	nw.	26	16	9	6	3.6	
Lincoln	1,189	11	84	28.74	30.02	— .01	52.6	— 1.5	84	7	64	26	10	42	40	44	38	66	2.12	+ 0.1	9	8,003	se.	54	nw.	26	12	10	9	5.2	T.
Omaha	1,105	115	121	28.84	30.03	.00	52.8	— 0.1	80	7	62	28	10	44	29	44	37	62	1.56	— 0.9	6	6,439	s.	43	**nw.**	26	11	7	13	5.6	
Valentine	2,598	47	54	27.30	30.05	+ .04	46.2	— 3.0	90	12	59	16	10	34	50	39	33	69	3.42	+ 2.5	8	9,374	nw.	41	nw.	28	14	8	9	4.6	18.5
Sioux City	1,135	98	164	28.78	30.01	— .01	50.0	— 1.0	79	7	60	24	10	40	38	....	....	....	3.73	+ 2.0	9	9,896	nw.	50	nw.	8	11	11	9	5.0	T.
Pierre	1,572	43	80	28.34	30.02	+ .01	50.8	+ 1.4	94	3	63	22	10	38	53	41	35	66	3.05	+ 2.4	5	5,957	**nw.**	37	se.	16	10	12	9	4.9	2.0
Huron	1,306	56	67	28.61	30.02	+ .01	46.8	+ 0.3	84	2	59	15	10	34	46	40	35	72	3.19	+ 1.9	7	10,326	nw.	48	s.	3	8	12	11	6.1	
Yankton	1,233	49	57	28.68	30.00	— .01	49.7	0.0	83	7	61	23	10	39	42	....	....	....	4.01	+ 2.6	9	6,800	w.	42	nw.	29	10	8	13	6.2	T.
Northern Slope.							47.1	+ 1.0										66	1.46	+ 0.6									4.7	
Havre	2,506	11	44	27.34	29.99	+ .01	48.4	+ 4.4	79	10	61	21	30	35	50	41	36	68	0.57	0.0	7	5,476	w.	39	n.	28	10	14	7	5.2	
Miles City	2,371	26	48	27.50	30.07	+ .07	50.6	+ 4.5	89	1	64	20	22	37	51	41	35	64	0.30	— 0.6	4	4,664	sw.	36	w.	28	12	15	4	4.1	
Helena	4,110	8	56	25.86	30.08	+ .05	47.8	+ 2.6	78	2	58	19	21	38	31	39	32	59	0.15	— 0.7	4	6,076	sw.	38	sw.	7	8	11	12	5.9	T.
Kalispell	2,962	8	34	27.00	30.08	+ .07	47.2	.....	73	9	58	24	22	36	35	40	35	71	0.75	.....	7	3,718	w.	25	sw.	30	8	9	14	6.1	
Rapid City	3,234	46	50	26.62	30.07	+ .06	47.8	— 1.2	84	1	61	21	30	35	48	39	33	64	1.79	+ 1.1	5	4,782	w.	30	nw.	26	18	7	6	3.6	7.0
Cheyenne	6,088	56	64	24.05	30.07	+ .06	44.2	— 0.7	78	2	56	16	21	32	45	35	28	62	2.33	+ 1.6	7	7,583	**nw.**	41	nw.	3	17	8	6	3.9	23.1
Lander	5,372	26	36	24.71	30.12	+ .08	43.8	+ 0.3	82	2	60	8	23	28	44	36	30	69	2.04	+ 1.0	4	2,182	sw.	24	nw.	16	10	16	5	4.3	20.4
Yellowstone Park	6,200	11	48	23.94	30.10	+ .08	42.2	.....	71	2	54	4	22	30	36	34	27	61	1.07	.....	9	5,733	sw.	36	sw.	16	10	11	10	5.2	9.9
North Platte	2,821	11	51	27.11	30.06	+ .04	46.9	— 2.9	88	12	60	20	10	33	52	40	36	77	3.05	+ 2.1	8	6,823	w.	38	ne.	23	14	7	10	4.1	9.8
Middle Slope.							52.6	— 2.7										66	1.76	+ 0.2									4.0	
Denver	5,291	129	136	24.78	30.07	+ .06	49.4	— 1.1	83	3	62	18	21	36	40	39	31	59	1.98	+ 1.1	6	5,631	s.	44	ne.	26	21	4	6	3.4	22.7
Pueblo	4,685	80	86	25.33	30.03	+ .04	50.2	— 2.0	87	3	64	16	23	36	44	40	33	60	1.11	+ 0.4	5	5,168	nw.	41	n.	3	29	6	5	3.2	5.2
Concordia	1,398	42	47	28.56	30.05	+ .02	53.2	— 1.3	87	7	64	25	10	42	41	45	39	69	1.94	— 0.2	6	5,361	se.	27	nw.	26	17	3	11	4.5	
Dodge	2,509	44	54	27.44	30.05	+ .03	51.4	— 3.7	84	3	64	23	31	39	42	44	40	74	1.96	+ 0.7	7	7,418	se.	36	se.	19	15	8	8	4.5	
Wichita	1,358	78	86	28.62	30.06	+ .03	55.4	— 2.2	85	7	66	30	31	44	37	46	40	65	2.12	— 0.3	8	6,254	nw.	33	n.	26	11	11	9	4.9	
Oklahoma	1,214	10	47	28.74	30.04	+ .01	56.2	— 5.8	83	4	68	27	31	45	36	48	43	70	1.58	— 0.5	5	11,113	s.	46	n.	27	19	3	9	3.4	
Southern Slope.							56.1	— 3.3										71	1.65	— 0.2									3.7	
Abilene	1,738	45	54	28.23	30.04	+ .03	59.6	— 4.9	87	8	72	31	31	48	34	51	46	70	1.73	— 0.6	5	5,982	n.	25	s.	12	15	7	9	4.3	
Amarillo	3,676	10	49	26.29	30.03	+ .03	53.4	— 2.8	87	3	66	23	23	41	37	45	40	73	2.49	+ 0.8	7	9,032	se.	33	se.	19	18	6	7	3.1	9.0
Del Rio	944	8	57	29.01	30.00	+ .02	65.0	.....	89	2	79	38	24	51	45	....	....	....	1.16	.....	6	5,553	se.	31	nw.	5	15	10	6	4.0	
Roswell	3,578	9	57	26.35	29.99	+ .03	55.2	— 3.8	88	3	72	21	23	38	50	45	40	70	0.73	— 0.8	4	4,205	s.	30	nw.	26	18	6	7	3.3	0.7
Southern Plateau.							60.2	0.0										42	0.36	— 0.4									1.8	
El Paso	3,762	10	110	26.20	29.95	+ .03	61.7	— 1.3	88	17	77	33	24	46	43	47	35	47	0.44	— 0.5	3	6,311	e.	52	ne.	5	25	5	1	1.8	
Santa Fe	7,013	33	39	23.29	30.00	+ .04	47.4	— 2.4	72	3	60	13	23	35	33	37	29	56	1.68	+ 0.6	5	5,610	ne.	53	se.	21	22	7	2	2.2	12.8
Flagstaff	6,907	12	44	23.39	29.96	+ .04	46.2	— 0.8	75	16	63	9	22	29	46	34	23	50	0.10	— 1.8	3	4,846	ne.	36	ne.	23	21	5	5	2.5	0.6
Phoenix	1,108	50	86	28.74	29.88	.00	71.6	+ 1.8	99	3	88	37	22	56	41	53	36	31	T.	— 0.4	0	2,883	e.	25	nw.	1	27	3	1	1.6	
Yuma	141	16	46	29.72	29.86	— .01	74.4	+ 1.6	104	2	90	41	22	58	45	57	43	39	0.01	— 0.3	1	3,850	n.	27	n.	4	28	1	2	1.0	
Independence	3,910	11	42	26.04	30.02	+ .07	59.8	+ 1.1	88	2	76	31	23	44	42	44	27	52	T.	— 0.3	0	4,883	n.	33	n.	4	25	4	2	1.5	
Middle Plateau.							50.5	+ 0.5										45	0.37	— 0.6									2.7	
Reno	4,532	56	63	25.57	30.09	+ .10	51.8	+ 1.6	82	10	69	19	22	34	45	41	29	48	0.08	— 0.2	1	3,576	w.	28	w.	16	26	4	1	1.4	T.
Tonopah	6,089	12	20	24.16	30.08	.....	54.0	.....	81	2	64	18	20	44	36	39	20	27	0.11	.....	1	6,260	w.	40	nw.	3	23	7	1	2.3	
Winnemucca	4,344	18	56	25.73	30.14	+ .09	49.8	+ 1.6	83	9	69	14	22	31	52	36	23	43	T.	— 0.4	0	4,062	ne.	31	nw.	3	15	10	6	4.0	T.
Modena	5,479	10	43	24.66	30.02	+ .06	49.3	+ 0.8	82	3	67	13	23	32	45	36	23	41	0.34	— 0.2	2	6,835	w.	37	sw.	16	19	10	2	2.6	T.
Salt Lake City	4,366	105	110	25.70	30.07	+ .06	52.6	+ 0.3	85	2	64	27	23	41	33	41	30	44	0.39	— 1.2	3	4,433	se.	52	ne.	21	17	7	7	3.3	T.
Durango	6,546	18	56	23.68	29.98	+ .01	47.8	— 0.4	77	16	63	15	23	32	42	37	29	60	0.89	— 0.9	4	4,316	nw.	22	w.	17	22	6	3	2.5	6.9
Grand Junction	4,608	43	51	25.44	30.03	+ .04	52.0	— 0.8	83	3	66	27	23	38	38	40	31	52	0.50	— 0.7	4	2,996	nw.	35	nw.	3	25	1	5	2.6	T.
Northern Plateau.							52.7	+ 2.6										55	0.47	— 0.8									4.8	
Baker City	3,471	48	58	26.55	30.16	+ .03	49.2	+ 1.1	79	10	62	22	22	36	37	41	32	55	0.10	— 1.0	4	4,899	s.	26	w.	11	12	12	7	4.5	0.5
Boise	2,739	78	86	27.26	30.13	+ .07	54.0	+ 4.6	86	10	67	26	22	41	37	43	31	45	0.20	— 0.8	4	4,073	nw.	48	nw.	11	13	12	6	4.2	T.
Lewiston	757	10	51	29.31	30.12	+ .05	54.4	+ 1.1	84	9	66	28	21	43	36	....	....	....	0.36	— 0.8	6	3,549	e.	48	w.	2	10	7	11	5.8	
Pocatello	4,477	46	54	25.57	30.10	+ .06	51.4	+ 3.4	82	2	64	20	22	39	37	39	28	46	0.46	— 0.6	5	7,077	se.	44	sw.	12	15	14	2	3.5	0.9
Spokane	1,929	101	110	28.05	30.11	+ .05	50.6	+ 2.6	79	9	62	25	21	40	40	44	37	63	0.65	— 0.9	5	5,189	sw.	36	sw.	25	7	14	10	5.9	
Walla Walla	1,000	71	79	29.05	30.13	+ .06	56.8	+ 2.8	82	8	66	32	21	47	32	50	45	66	1.05	— 0.5	7	4,355	s.	26	s.	2	13	9	9	4.9	
N. Pac. Coast Reg.							53.3	+ 1.0										82	4.52	0.0									6.0	
North Head	211	11	56	29.90	30.13	+ .08	54.5	+ 1.1	83	8	59	43	20	50	30	52	49	84	6.45	+ 1.0	19	12,117	se.	70	se.	2	7	9	15	6.5	
Port Crescent	259	12	29	29.83	30.11	+ .09	49.0	+ 1.4	67	8	56	29	21	43	21	....	....	....	5.49	+ 1.8	18	3,735	se.	19	sw.	25	3	9	19	7.7	
Seattle	123	185	224	30.01	30.14	+ .09	54.0	+ 2.5	81	9	60	37	21	48	31	50	46	80	3.16	+ 0.2	15	7,277	s.	41	s.	25	5	13	13	6.8	
Tacoma	213	113	120	29.90	30.13	+ .09	53.0	+ 2.4	81	9	60	31	21	46	33	....	....	....	5.46	+ 1.5	17	4,664	sw.	28	sw.	25	7	6	18	6.8	
Tatoosh Island	86	7	57	29.98	30.08	+ .07	52.0	+ 1.6	64	9	56	42	19	48	10	50	47	85	6.62	— 1.9	21	11,217	e.	57	s.	25	4	6	21	7.6	
Portland, Oreg.	153	68	96	29.99	30.15	+ .09	55.6	+ 2.2	83	9	63	35	20	48	29	52	48	79	3.43	— 0.6	13	3,847	nw.	25	w.	18	4	7	20	7.2	
Roseburg	510	9	57	29.62	30.18	+ .10	54.8	+ 2.1	83	9	66	32	23	43	42	50	47	81	1.04	— 1.7	11	1,740	s.	18	s.	15	6	15	10	5.6	

TABLE I.—*Climatological data for U. S. Weather Bureau stations, October, 1906*—Continued.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.									Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness during daylight, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
Mid. Pac. Coast Reg.							61.1	+ 3.0									54		0.14	— 1.6									2.6	
Eureka	62	62	80	30.09	30.16	+ .10	54.4	+ 2.3	77	5	61	39	20	48	29	51	48	82	0.67	— 2.2	5	4,440	n.	42	n.	4	16	9	6	3.7	
Mount Tamalpais	2,375	11	18	27.61	30.06	+ .05	63.2	.....	84	27	70	42	19	57	21	48	32	35	0.00	.....	0	15,306	nw.	72	nw.	2	19	9	3	2.3	
Point Reyes Light	490	7	18	29.50	30.01	.....	56.4	+ 2.3	79	6	62	46	23	51	27	.....	.....	.....	0.00	— 2.3	0	16,898	n.	71	nw.	18	14	12	5	3.9	
Red Bluff	332	50	56	29.68	30.03	.00	67.7	+ 4.2	94	9	82	41	23	54	39	53	39	41	T.	— 1.4	0	4,976	nw.	32	nw.	3	22	6	3	2.3	
Sacramento	69	106	117	29.94	30.01	+ .02	65.4	+ 3.6	91	2	79	41	22	52	35	52	40	44	T.	— 0.9	0	6,303	nw.	33	n.	20	25	5	1	1.5	
San Francisco	155	200	204	29.88	30.05	+ .04	61.7	+ 2.4	86	5	70	47	29	54	30	53	47	68	0.03	— 1.2	3	5,655	w.	44	ne.	20	23	6	2	2.4	
San Jose	141	78	88	29.87	30.02	.....	60.7	.....	90	5	77	31	22	44	45	.....	.....	.....	0.01	.....	1	.....	nw.	.....	.....	.....	23	7	1	2.0	
Southeast Farallon	30	9	17	30.02	30.05	.....	54.3	.....	73	5	57	46	24	51	19	.....	.....	.....	0.00	.....	0	13,272	nw.	58	nw.	18	15	5	11	4.5	
S. Pac. Coast Reg.							66.1	+ 2.7									56		0.01	— 0.6									1.7	
Fresno	330	67	70	29.64	30.00	+ .04	66.0	+ 1.1	94	1	82	36	20	50	38	51	37	43	0.00	— 0.5	0	3,688	nw.	24	nw.	19	29	0	2	0.9	
Los Angeles	338	116	123	29.58	29.94	— .01	68.6	+ 4.9	99	1	81	48	22	56	39	55	46	56	0.00	— 0.7	0	3,826	w.	24	ne.	20	23	6	2	2.0	
San Diego	87	94	102	29.82	29.91	— .04	65.4	+ 2.2	89	1	73	46	22	58	26	58	53	72	0.03	— 0.4	2	4,117	nw.	23	nw.	23	24	4	3	2.2	
San Luis Obispo	201	47	54	29.78	30.00	+ .01	64.7	+ 2.7	94	2	80	35	22	49	46	51	42	55	T.	— 1.0	0	4,103	n.	20	n.	16	28	1	2	1.7	
West Indies.																															
Grand Turk	11	6	20	29.87	29.88	— .03	83.0	.....	92	22	90	69	17	77	.....	.....	.....	.....	1.17	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	
San Juan	82	48	90	29.82	29.90	.00	80.7	+ 0.3	93	20	86	72	30	75	16	75	73	77	3.44	— 2.7	17	6,860	e.	27	se.	6	8	17	6	5.1	
Panama.																															
Ancon	74	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Naos	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	

TABLE II.—*Climatological record of cooperative observers, October, 1906.*

Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*	*Alaska*—Cont'd.	°	°	°	*Ins.*	*Ins.*	*Arizona*—Cont'd.	°	°	°	*Ins.*	*Ins.*
Alaga				7.96		Sitka	65	34	46.6	15.22		Signal	99	41	71.6	0.00	
Ashville	80	28	58.3	3.76		*Arizona.*						Silver Bell	96	44	73.4	0.07	
Auburn	77	34	61.1	4.45		Allaire Ranch				0.17		Tempe	103	28	69.4	T.	
Bermuda	89	32	62.3	0.55		Arizona Canal Co. Dam	103	34	72.4	T.		Thatcher	95	29	61.8	T.	
Boligee	82	30	61.8	3.93		Aztec	110	42	75.4	0.00		Tombstone	84	30	62.3	0.43	
Bridgeport				5.96		Benson	93	25	63.2	0.35		Tuba	86	23	55.9	0.07	0.1
Camphill				2.80		Bisbee	81	28	61.1	0.44		Tucson	96	29	68.8	T.	
Cedar Bluff				3.54		Blue	81	18	53.2	0.26	T.	Upper San Pedro	90	21	60.7	0.50	
Citronelle	88	36	65.5	2.12		Bonita				0.00		Vail*	102	49	70.3	T.	
Clanton	82	29	60.9	5.01		Bowie	93	25	62.2	0.03		Walnut Grove				T.	
Cordova	87	27	60.6	2.77		Buckeye	104	29	68.0	T.		Willcox	90	18	57.2	0.00	
Daphne	86	42	66.6	4.61		Casagrande	104	25	64.6	0.00		Yarnell				0.29	
Decatur	88	28	60.4	4.33		Clarsons Mill	60	13	39.9	0.89	4.5	Young	90	20	54.8	0.16	
Demopolis				3.32		Clifton				0.05		*Arkansas.*					
Eufaula	78	33	60.4	3.74		Cline	96	27	64.8	0.00		Alicia	83	32	57.7	2.04	
Evergreen		34	60.2[b]			Cochise*[1]	90	23	62.6	T.		Amity	82	31	58.4	2.35	
Flomaton	90	31	63.8	0.20		Columbia	101	34	67.8	T.		Arkadelphia	85[c]	32[c]	58.2[c]	3.33	
Florence	87	29	59.8	3.83		Congress	93	39	71.0	0.00		Arkansas City				3.70	
Fort Deposit	84	33	63.0	2.17		Douglas	91	23	63.1	0.31		Arnett	78	30	55.4	1.13	
Gadsden	85	29	61.3	5.06		Dudleyville	93	26	64.3	0.07	T.	Batesville	85	31	58.2	3.37	
Goodwater	83	31	61.9	3.84		Duncan	96	20	58.6	T.		Beebranch	84	27	57.2	2.95	
Greensboro	81	34	61.8	4.78		Fish Creek				T.		Black Rock				2.99	
Guntersville				4.88		Flagstaff	72	9	47.8	0.08	0.8	Boonville	87	28	59.0	2.00	
Hamilton	85	27	60.0	6.67		Fort Apache	84	18	56.5	0.45		Brinkley	88	32	59.4	3.67	
Highland Home	84	36	63.1	1.38		Fort Huachuca	89	27	62.0	1.07		Calico Rock				3.38	
Livingston	79	30	60.0	4.28		Fredonia	83	20	53.0	T.		Camden	88	34	59.4	2.39	
Lock No. 4	81	29	59.8	3.61		Gilabend	106	37	73.1	0.00		Center Point	83	33	60.3	2.50	
Lucy	86	35	65.1	4.42		Grand Canyon	82	24	59.7	0.20	2.0	Clarendon				3.36	
Madison Station	87	28	61.4	4.12		Greaterville	85	26	61.2	0.82		Conway	82	32	57.9	3.39	
Maplegrove	82	27	59.1	3.97		Greer				0.04	T.	Cornerstone	88[d]	30[d]	58.5[d]	2.61	
Marion	82	36	63.3	0.82		Holbrook	89	16	53.8	T.	T.	Corning	85	29	58.4	0.83	
Milstead				2.04		Huachuca Res				0.64		Dardanelle				2.08	
Newbern	85	31	61.9	3.63		Intake Dam				0.02		Des Arc	94	33	60.8	4.08	
Oneonta	81	25	58.1	2.17		Jerome	88	32	64.3	T.	T.	Dodd City	85	26	56.2	1.50	
Opelika	81	31	60.8	4.16		Keams Canyon	89	17	50.2	0.10	T	Dutton	83	27	55.4	1.10	
Ozark	81	34	62.6	3.86		Maricopa	105	30	70.6	0.00		Eldorado	85	34	60.2	2.98	
Prattville				1.41		Mesa	103	30	70.5	T.		Eureka Springs	84	28	56.2	0.72	
Pushmataha	86	30	61.6	6.95		Mohawk Summit*[1]	98	53	74.6	0.00		Fayetteville	84	28	57.2	1.01	
Riverton	85	28	57.6	5.08		Natural Bridge				0.00		Forrest City	84	33	58.5	1.89	
Scottsboro	83	27	59.4	2.74		Nutrioso				0.22	0.1	Fulton				2.50	
Selma	82	32	62.1	0.10		Oracle	86	32	63.0	0.02		Hardy	83	29	57.7	2.28	
Spring Hill				2.85		Paradise	88	22	59.9	0.22		Harrison	86	25	55.1	1.33	
Talladega	81	29	60.6	4.47		Parker	110	34	72.4	0.00		Heber	86[f]	30	58.8[c]	3.00	
Thomasville	81	35	60.2	2.80		Phoenix (Ex. Farm)	99	32	69.2	0.03		Helena	85	35	61.0	3.59	
Tuscaloosa	82	31	59.7	3.27		Picacho*[5]	98	42	76.8	0.00		Hope	87	33	61.1	2.55	
Tuscumbia	80	31	58.5	3.89		Pinal Ranch				0.05	T.	Hot Springs	82	30	57.6	2.52	
Tuskegee	84	33	63.6	3.20		Pinto				0.30	3.0	Huntsville	82	26	55.5	0.90	
Union Springs	80	35	61.4	2.60		Prescott	85	16	53.8	0.48	1.0	Jonesboro	88[c]	28	60.4[c]	2.52	
Uniontown	84	35	62.6	2.97		Roosevelt	102	18	65.8	0.25		La Crosse	84[c]	32[c]	58.1[c]		
Valleyhead	85	25	58.3	5.28		St. Johns	85	15	52.0	T.	T.	Lewisville	85	32	59.8	2.90	
Vienna				2.80		St. Michaels	75	16	47.7	0.45	1.1	Lutherville	83	28	56.5	1.51	
Wetumpka	85	31	62.4	2.41		San Carlos	98	25	64.4	0.12		Luxora				1.25	
Alaska.						San Simon	88	20	53.2	0.01		Malvern	82	31	56.2	3.05	
Fort Gibbon	42	— 2	19.4	0.50	4.5	Seligman	86	21	55.2	0.11		Mammoth Springs	84	25	55.6	2.63	
Killisnoo	65	33	44.8	8.40		Sentinel*[1]	105	50	73.2	0.00		Marked Tree				3.15	
North Fork	44	—17	20.9	0.90	9.0	Show Low				0.24	2.2	Marvell	85	34	59.8	2.73	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Arkansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mena	79	32	58.9	2.01	
Montrose	88	32	59.6	3.27	
Mount Nebo	73	33	56.6	2.80	
Mossville	78[f]	27[f]	54.6[f]		
Mountain Home	83[e]	28	55.6[e]	2.14	
Newport	87	31	59.4	3.40	
Ozark	87	33	59.1	1.13	
Pinebluff	83	33	58.0	2.86	
Pocahontas	86	28	59.4	1.41	
Pond	82	28	55.6	1.42	
Prescott	87	33	60.3	2.67	
Princeton				1.90	
Rison	87	31	58.8	2.13	
Rogers	83	30	56.8	0.28	
Russellville	80	31	56.1	2.64	
Spielerville	85	35	59.0	1.10	
Stuttgart	85	33	58.8	3.13	
Texarkana	86	35	62.0	1.16	
Warren	88	32	59.5	2.36	
White Cliffs				2.02	
Wiggs	86	27	56.9	2.09	
Witts Springs	78[f]	26[f]	54.3[f]	1.98	
California.					
Alturas	85	14	48.4	0.27	
Auburn	83	46	66.5	T.	
Azusa	103	38	67.4	0.00	
Bagdad	105	45	75.4	0.00	
Bakersfield	97	32	65.2	0.00	
Barber	95	34	67.2	T.	
Bear Valley				0.58	
Berkeley	82	46	61.3	T.	
Bishop	90	25	58.3	0.00	
Blocksburg	90	29	58.4	0.53	
Blue Canyon	82	35	58.2	0.58	
Bodie	75	9	40.4	0.27	2.4
Branscomb	88	29	59.2	0.02	
Brush Creek	86	24	56.5	0.13	
Butte Valley				0.17	
Calexico	105	42	73.3	0.13	
Campbell	91	29	59.8	0.00	
Campo				0.10	
Cedarville	88	20	51.0	0.08	
Chico				T.	
Claremont	107	40	70.6	0.00	
Cloverdale	94	33	65.6	0.00	
Colfax	91	24	60.4	T.	
Colusa	87	40	65.5	0.00	
Craftonville				0.00	
Crescent City	82	35	52.4	2.89	
Crockers				T.	
Cuyamaca	75	27	53.6	0.80	
Delta	94	40	65.4	T.	
Diamond				0.04	
Dobbins	96	39	67.2	0.00	
Durham	95	31	65.2	T.	
Elcajon	107	34	68.4	T.	
Electra	94	37	66.6	0.00	
Elmwood	101	42	67.3	0.00	
Elsinore	100	28	63.4	0.04	
Emigrant Gap	80	28	57.6	0.60	
Escondido	100	26	64.2	0.07	
Folsom	98	35	67.2	0.00	
Fordyce				0.62	T.
Fort Bragg				0.00	
Fort Ross	73	38	53.8	0.14	
Georgetown	88	33	62.4	0.21	
Gilroy (near)	96	30	61.4	0.02	
Gold Run	93	37	65.2	0.29	
Grass Valley				0.07	
Greenville	88	17	52.5	0.25	
Groveland				0.00	
Hanford	89	30	59.8	0.00	
Healdsburg	100	30	66.2	0.00	
Heber	110	38	75.0	0.12	
Hollister	95	30	62.0	0.01	
Indio	109	40	76.4	T.	
Iowa Hill	90	35	64.2	0.20	
Isabella				0.00	
Jamestown	92	30	61.0	T.	
Kennedy Gold Mine				0.00	
Kentfield				T.	
Kernville				0.00	
King City	100	25	63.6	0.00	
Laporte	78	28	52.8	0.60	T.
Laytonville				0.00	
Legrande	97	32	65.7	T.	
Lemoncove	94	34	68.8	0.00	
Lick Observatory	79	32	58.6	0.05	
Livermore	96	35	64.7	0.03	
Lodi	96	31	61.8	T.	
Lone Pine	87	25	58.2	0.00	
Los Gatos	90	37	61.7	T.	
Magalia	85	28	58.0	0.08	
Mammoth	108	53	82.2	0.00	
Marysville	98	33	64.8	0.60	
Mecca	103	39	73.6	0.00	
Merced	69	29	65.7	0.00	
Mills College				0.02	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Milton (near)	91	42	66.8	T.	
Mohave	93	36	67.0	0.00	
Mokelumne Hill	90	39	66.2	T.	
Montague	86	19	54.0	T.	
Monterio	92	36	65.6	0.00	
Monumental	80	30	52.7	3.97	
Mount St. Helena				0.08	
Napa	95	42	65.6	0.00	
Needles	99	36	68.4	0.00	
Nellie				0.25	
Nevada City	91	27	58.8	0.10	
Newman	99[d]	36[d]	68.2[d]	T	
Niles	90	34	61.6	0.10	
Nimshew	86	36	63.0	0.07	
North Bloomfield	88	29	59.5	0.14	
Oakland	84	43	60.8	0.00	
Ojai Valley	100	35	68.4	0.00	
Orland	94	32	62.6	1.20	
Oroville (near)	93	44	67.2	T.	
Palermo	96	35	64.7	T.	
Peachland	94	31	61.6	T.	
Pine Crest	95	51	70.8	0.00	
Placerville	84	26	56.8	0.00	
Point Lobos	76	52	61.6	T.	
Porterville	95	35	66.5	0.00	
Poway	103	31	66.3	0.03	
Priest Valley				0.00	
Quincy	78	18	47.6	0.17	
Redding	90	39	66.6	T.	
Redlands	102	39	69.6	0.00	
Reedley	97	33	65.7	0.00	
Represa				0.00	
Rialto	100	51	76.2	0.00	
Riovista	88	35	65.0	T.	
Riverside	100	31	65.3	0.00	
Rocklin	92	34	64.4	0.00	
Sacramento	82	36	60.6	T.	
Salinas	90	34	59.8	0.00	
San Bernardino	103	31	68.0	0.01	
San Jacinto	101	32	69.7	0.00	
San Leandro	88	36	60.0	0.06	
Santa Barbara	89	45	65.6	0.00	
Santa Clara College	93	30	61.0	T.	
Santa Cruz	97	32	62.0	0.00	
Santa Maria	92	38	62.0	0.00	
Santa Monica	88	42	61.4	0.00	
Santa Rosa	95	31	62.4	0.00	
Shasta	101	38	70.2	0.00	
Sierra Madre	100	47	70.7	T.	
Sisson	85	28	51.4	0.11	
Sonoma	90	35	63.0	T.	
Sterling	85	30	57.4	0.00	
Stockton	86	36	63.0	T.	
Storey	94	27	62.4	0.00	
Summerdale	81	26	57.0	T.	
Summit	77	18	54.5	0.12	T.
Susanville	78	19	49.4	0.10	
Tamarack	71	8	44.9	0.42	4.0
Towle	87	30	58.1	T.	
Truckee	70	28	50.8	0.26	
Tulare	90	28	62.0	0.00	
Tustin (near)				0.00	
Ukiah	98	26	60.2	0.10	
Upland	96	41	67.8	0.00	
Upperlake	94	33	63.6	T.	
Upper Mattole				0.43	
Vacaville	96	34	65.7	0.00	
Visalia	96	39	68.1	0.00	
Wasco	95	32	64.0	0.00	
Wheatland	88	36	63.0	T.	
Willets	86	18	58.0	0.21	
Willows				T.	
Woodleaf				0.95	
Woodside	87	41	59.5	0.00	
Yosemite	87	22	54.6	0.01	
Yreka				0.14	
Zenia	87	30	57.9	1.13	
Colorado.					
Akron				1.90	16.0
Alford	79	21	49.7	2.43	34.5
Antelope Springs	72	−11	35.4	2.40	19.5
Arriba	81	12	47.2	1.93	7.0
Ashcroft	68	4	36.8	1.64	18.5
Blaine	88	17	50.8	2.29	1.0
Boulder	82	19	51.9	1.80	19.0
Breckenridge	66	3	37.8	0.91	11.0
Buena Vista	71	10	42.4	1.59	15.0
Burlington	87	20	48.9	2.05	8.0
Canyon	83	16	52.4	2.30	18.0
Castlerock	82	12	44.0	3.53	36.0
Cheesman	76	11	45.8	2.16	16.0
Cheyenne Wells	87	29	51.6	0.90	3.0
Chromo				1.91	8.5
Clearview	68	−2	39.2	2.09	12.0
Collbran	80	14	47.4	0.67	T.
Colorado Springs	79	16	46.7	1.02	5.1
Cope	86	17	49.4	1.83	10.4
Cripplecreek				2.68	35.5

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*
Dunkley	71	4	39.4	0.57	8.0
Eagle	76	8	43.0	1.20	7.0
Fort Collins	83	19	46.3	1.59	15.5
Fort Morgan	88	9	46.8	2.21	32.0
Fowler				1.19	5.0
Frances	68	8	40.4	1.86	13.0
Fruita	84	23	49.1	0.45	0.5
Garnett	75	−12	39.1	2.37	16.0
Gleneyre	80	15	46.4	1.21	2.5
Gothic	65	1	37.0	1.15	10.5
Grand Valley	82	16	48.9	0.45	0.2
Greeley	85	24	52.4		
Grover				1.70	17.0
Gunnison	79	0	39.0	0.41	4.0
Hahns Peak	70	0	43.0	0.98	9.5
Hamps	79	9	44.8	0.64	4.0
Hoehne	88	4	47.6	2.16	8.0
Holly	91	20	56.2	1.15	2.0
Holyoke (near)	88	17	48.0	2.62	18.0
Idaho Springs	74	10	44.4	2.13	21.0
Lake City	70	−1	41.5	2.13	33.0
Lake Moraine	63	−1	35.4	3.04	38.0
Lamar	90	21	52.6	1.45	5.0
Laporte				1.80	19.5
Las Animas	90	15	51.4	1.35	5.0
Lay	78	11	41.6	1.21	9.0
Leroy	87	19	47.2	2.69	13.0
Longs Peak	67	3	37.0	1.79	22.0
Lujane	78	12	48.4	1.02	7.0
Manassa	74	−8	38.6	1.47	14.0
Mancos	75	7	46.4	1.26	15.0
Meeker	78	8	42.8	1.35	8.0
Montrose	78	16	48.2	1.13	6.0
Moraine	69	10	4.16	1.77	24.0
Pagoda	76	10	43.2	0.69	6.0
Paonia	79	10	50.6	0.88	2.0
Platte Canyon				2.44	22.0
Rangely	80	14	46.6	0.66	T
River Portal	73	19	45.4	0.87	4.0
Rockyford	86	13	50.9	1.57	10.0
Saguache	76	2	42.6	3.58	33.0
Salida	77	2	44.5	3.91	31.0
San Luis	75	6	43.2	1.04	4.0
Santa Clara	77	−2	44.5	3.83	43.0
Sapinero	70	4	39.6	0.94	11.9
Sheridan Lake	90	12	49.8	1.05	2.5
Silt	79	16	48.6	0.51	1.5
Silverton	68	9	38.2	2.50	14.0
Stonewall				2.40	23.0
Sugar City	90	15		1.53	T.
Trinidad	83	2	49.0	1.72	8.0
Victor	68	2	42.4	3.05	39.8
Vilas				1.57	T.
Wagon Wheel	76	−6	37.8	2.46	30.0
Waterdale	85	18	48.4	1.14	9.0
Whitepine	68	−2	35.0	0.50	6.0
Wray	88	19	49.2	1.43	8.0
Yuma				2.92	26.0
Connecticut.					
Bridgeport	76	31	55.0	7.12	
Canton	72	24	50.1	5.63	
Colchester	73	25	52.2	6.56	
Falls Village				3.25	0.2
Hawleyville	75	25	52.0	4.54	
Lake Konomoc				8.78	
New London	73	31	54.6	7.42	T.
North Grosvenor Dale	77	23	51.4	4.08	
Norwalk	75	26	52.6	5.66	
Southington	73	25	52.9	6.05	
South Manchester				4.27	
Storrs	73	28	52.2	4.85	
Voluntown	78	20	51.9	7.49	
Wallingford	76	24	52.4	6.95	T.
Waterbury	77	24	53.6	6.26	T.
West Cornwall	76	27	51.2	4.02	
West Simsbury				5.75	
Delaware.					
Delaware City				4.79	
Dover	78[b]	34[d]	57.8[c]	4.19	
Milford	81	29	58.2	3.49	
Millsboro	81	28	57.8	5.71	
Newark	77	29	55.7	3.92	
Seaford	76	30	57.0	4.70	
District of Columbia.					
West Washington	82	28	56.5	6.71	
Florida.					
Apalachicola	86	46	69.4	3.07	
Archer	93	38	70.3	0.66	
Avon Park	94	55	75.2	0.94	
Bartow	93	51	74.2	1.78	
Bonifay	85	37	65.6	1.88	
Brooksville				0.94	
Clermont	95	51	75.8	0.86	
De Funiak	85	36	64.8	1.30	
Deland	95	49	72.8		
Eustis	92	41	72.6	1.61	
Federal Point	92	47	70.9	4.11	
Fenholloway	92	40	69.7	0.36	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Florida—Cont'd.	°	°	°	*Ins.*	*Ins.*
Fernandina	89	42	69.4	4.03	
Fort Myers	88	58	74.8	2.41	
Fort Pierce	93	59	74.6	7.34	
Gainesville	91	43	70.2	1.83	
Grasmere	88	44	71.4	.....	
Huntington	91	45	70.7	6.06	
Hypoluxo	95	60	77.0	9.76	
Inverness	90	46	71.0	0.83	
Jasper	90	40	68.6	1.17	
Kissimmee	90	51	73.8	2.00	
Lake City	88	40	66.1	3.89	
Macclenny	.....	.....	.....	1.37	
Madison	89	39	66.6	2.47	
Malabar	94	55	76.0	3.55	
Manatee	92	52	74.6	2.10	
Marianna	84	36	64.2	3.85	
Merritt Island	90	56	74.5	3.11	
Miami	90	58	77.0	13.68	
Middleburg	91	39	68.8	5.68	
Molino	85	30	63.0	4.12	
Monticello	85	39	66.0	3.28	
Mount Pleasant	86	50	71.1	1.32	
New Smyrna	95	46	74.4	2.96	
Ocala	94	43	71.4	0.88	
Orange Home	92	44	72.6	1.23	
Orlando	95	49	74.4	1.39	
Plant City	95	45	74.2	2.42	
Rockwell	93	48	72.8	1.13	
St. Andrew	85[e]	37[e]	66.0[e]	4.19	
St. Augustine	91	46	69.8	6.33	
St. Leo	90	47	72.7	1.01	
Stephenville	90	38	69.6	1.56	
Switzerland	91	44	68.7	4.62	
Tallahassee	83	42	65.6	4.75	
Tarpon Springs	90	46	72.4	3.54	
Titusville	94	48	73.4	2.73	
Wausau	.....	.....	.....	2.50	
Georgia.					
Abbeville	.....	.....	.....	1.86	
Adairsville	79[e]	29[e]	59.8[e]	4.29	
Albany	85	35	66.2	2.25	
Allapaha	89	33	64.0	1.41	
Americus	82[d]	32	61.4[e]	2.78	
Athens	75	34	58.3	2.05	
Bainbridge	91	31	65.5	3.57	
Blakely	.....	.....	.....	5.95	
Brunswick	90	39	69.6	3.78	
Camak	82	28	60.3	2.19	
Carlton	.....	.....	.....	2.53	
Carrollton	80	29	57.9	3.68	
Clayton	80	26	56.7	6.12	
Columbus	83	35	63.5	8.34	
Cordele	83	33	62.0	2.27	
Cuthbert	84	32[e]	64.0[e]	4.73	
Dahlonega	82	29[d]	58.8[b]	3.89	
Dawson	85	32	64.6	5.37	
Diamond	80	27	56.6	3.36	
Dublin	.....	.....	.....	1.88	
Dudley	86	32	63.0	1.85	
Eastman	85	34	62.8	2.49	
Eatonton	82[e]	27[e]	60.2[e]	7.08	
Elberton	80	30	60.6	2.14	
Experiment	78	32	62.8	4.15	
Fitzgerald	86	35	64.2	.....	
Fleming	92	34	65.6	2.55	
Forsyth	86	31[e]	61.8[b]	5.36	
Fort Gaines	80	36	61.6	6.28	
Gainesville	78	31	57.8	2.33	
Gillsville	83	28	59.1	4.59	
Glenville	85	38	64.6	2.05	
Greenbush	80	28	58.0	6.51	
Greensboro	81	27	60.0	2.64	
Griffin	82	32	60.6	4.75	
Harrison	83	29	61.8	1.83	
Hawkinsville	94	29	63.0	0.42	
Lisbon	86	28	61.6	2.63	
Lost Mountain	78	27	58.0	3.58	
Louisville	84	33	63.3	1.28	
Lumpkin	85	31	61.6	4.18	
Marshallville	86	30	62.6	3.29	
Mauzy	.....	.....	.....	2.43	
Milledgeville	82	29	60.9	2.68	
Millen	87	29	62.6	1.77	
Montezuma	.....	.....	.....	2.46	
Monticello	81	30	60.6	5.70	
Morgan	81	35	62.8	5.19	
Newnan	80	30	60.2	5.77	
Oakdale	.....	.....	.....	0.81	
Point Peter	79	27	59.4	2.75	
Poulan	88	30	63.6	2.30	
Putnam	83	31	62.0	4.69	
Quitman	86	34	64.6	3.34	
Ramsey	80	30	59.9	4.50	
Rasaca	.....	.....	.....	8.45	
Rome	83	29	59.4	5.74	
St. George	87	40	68.2	1.16	
St. Marys	91	38	68.0	2.66	
Screven	88	34	66.6	3.53	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Georgia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Statesboro	86	35	64.4	0.89	
Talbotton	82	29	60.9	4.27	
Tallapoosa	82	28	60.0	3.60	
Toccoa	78	28	57.4	4.86	
Valdosta	86	34	65.2	0.27	
Valona	88	40	66.1	5.42	
Washington	76	32	59.2	2.70	
Waycross	87	40	66.6	1.77	
Waynesboro	81	35	62.0	1.97	
Westpoint	80	31	60.4	5.03	
Woodbury	80	28	58.8	5.12	
Idaho.					
American Falls	85	15	49.6	0.45	
Bannock River Cabin	81	13	46.6	0.25	2.5
Blackfoot	85	13	48.4	0.20	T.
Buhl	88	19	52.6	0.07	T.
Caldwell	87	19	52.6	0.16	
Cambridge	86	20	51.6	0.29	
Chesterfield	81	− 1	42.6	0.25	
Dent	79	26	52.4	1.83	
Deweys	74[c]	18	44.0	.....	1.1
Ellerslie	84	20	53.6	0.27	
Emmett	86	21	53.6	0.11	
Forney	78	7	41.7	0.98	2.0
Garnett	90	23	57.1	0.18	
Hot Springs	88	20	54.6	0.20	
Idaho Falls	82	16	48.4	0.32	0.5
Kellogg	82	23	48.4	2.23	
Lake	74	16	45.6	0.80	8.0
Lakeview	71	29	47.9	1.85	
Landore	72	16	44.4	2.31	3.5
Lardo	75	17	42.8	1.52	0.5
Lost River	78	20	47.4	0.05	T.
Lovell	83	20	47.0	1.32	
Meadows	79	19	47.6	1.18	
Milner	87	16	50.9	0.18	1.0
Minidoka	86	19	50.8	0.17	1.5
Moscow	79	28	50.8	0.82	
Mountain Home	89	7	50.8	0.21	
Murray	75	18	45.0	3.64	T.
Murtaugh	92[d]	19[d]	50.5[d]	0.30	2.0
Nevens Ranch	.....	.....	.....	0.25	
Oakley	83	15	48.8	0.60	7.0
Orofino	82	24	51.8	0.98	
Paris	78	11	41.1	0.37	2.6
Payette	85	22	53.3	0.05	
Pollock	84	27	55.0	0.71	
Poplars	.....	.....	.....	0.18	
Porthill	73	24	48.6	1.32	
St. Maries	86	22	49.4	2.27	
Salem	.....	.....	.....	0.75	
Salmon	84	11	46.2	0.19	T.
Standrod	.....	.....	.....	0.50	4.7
Twin Falls	85	14	50.8	0.06	T.
Vernon	79	20	45.8	0.77	1.1
West Lake	.....	.....	.....	2.58	
Weston	83	13	44.9	.....	
Illinois.					
Albion	77	26	55.9	2.14	
Aledo	78	21	52.2	1.57	
Alexander	80	23	54.8	0.95	
Antioch	78	21	50.2	2.25	T.
Ashton	75	22	50.6	2.28	T.
Astoria	77	21	52.5	1.37	T.
Aurora	75	24	51.2	2.25	T.
Benton	84	32	59.2	1.90	
Bloomington	82	21	54.6	1.85	T.
Bushnell	80	22	54.4	1.36	
Cambridge	79	21	53.2	1.47	
Carlinville	79	24	55.2	1.97	
Carlyle	.....	.....	.....	0.84	
Carrollton	.....	.....	.....	2.35	
Charleston	77	23	54.6	1.41	
Chester	80	30	58.0	2.86	
Cisne	85	25	58.8	2.95	
Coatsburg	78	21	53.5	0.82	
Cobden	83	26	57.8	1.67	
Colchester	80	24	54.8	1.44	
Decatur	80	23	53.8	2.46	
Dixon	78	21	49.9	1.84	T.
Dwight	78	20	52.8	1.54	T.
Elgin	78	21	51.2	1.99	1.5
Equality	84	27	58.4	1.56	
Flora	75[c]	25[c]	55.4[c]	2.29	
Friendgrove	78	26	56.2	2.30	
Galva	79	23	51.4	0.69	
Grafton	.....	.....	.....	1.41	
Greenville	79	26	56.1	1.48	
Griggsville	80	24	55.3	1.98	
Halfway	80	28	57.8	1.35	
Havana	85	25	56.4	0.85	
Henry	78	20	53.0	1.92	
Hillsboro	82	25	56.8	1.65	
Hooperston	77[c]	18[f]	51.4[f]	1.50	T.
Joliet	76	24	52.0	2.76	T.
Kishwaukee	79	22	51.0	1.83	T.
Knoxville	77	21	51.8	1.46	
Lagrange	77	23	50.7	2.72	0.5

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Larkarpe	83	20	54.0	1.00	
Lanark	78	16	50.2	1.95	T.
Lincoln	80	24	55.2	1.11	
Loami	.....	.....	.....	1.30	
McLeansboro	79	28	57.1	1.76	
Martinsville	83	21	56.0	0.80	
Martinton	85	19	53.8	1.80	T.
Mascoutah	79	27	55.0	1.85	
Minonk	78	21	52.2	1.50	T.
Monmouth	82	20	52.7	2.30	T.
Morrison	77	20	51.6	1.38	T.
Morrisonville	79	23	54.6	1.17	
Mount Carmel	.....	.....	.....	4.42	
Mount Vernon	82	24	57.6	1.87	
New Burnside	86	25	57.0	0.86	
Olney	79	28	56.8	2.98	
Ottawa	79	25	53.7	1.23	T.
Palestine	79	24	57.2	1.09	T.
Pana	75	23	54.4	1.03	
Paris	.....	.....	.....	0.42	
Philo	78	18	53.2	1.74	
Pontiac	77	24	53.7	1.61	T.
Rantoul	79	21	52.9	2.00	T.
Raum	84	29	58.2	2.12	
Riley	76	18	50.9	1.79	0.7
Robinson	79	25	56.2	1.99	
Rockford	76	26	53.4	2.19	
Rushville	79	24	55.0	0.52	
St. Charles	77	28	51.6	2.46	1.0
St. John	84	25	57.3	0.85	
Streator	78	23	52.4	1.64	T.
Sullivan	81	22	55.0	1.66	
Sycamore	79	20	50.4	2.02	T.
Tilden	82	28	57.2	1.52	
Tiskilwa	79	22	54.2	1.60	T.
Tuscola	81	20	54.0	1.42	
Urbana	78	20	53.1	1.36	
Vernon	80	24	56.6	1.05	
Walnut	79	22	52.8	1.22	
Warsaw	.....	.....	.....	0.83	
Windsor	77	23	54.8	1.58	
Winnebago	79	21	51.2	2.56	T.
Yorkville	77	20	50.4	2.40	T.
Zion	77	17	50.1	2.20	T.
Indiana.					
Anderson	75	23	53.6	2.09	T.
Angola	74	21	50.6	3.15	3.9
Auburn	76	20	48.8	2.29	T.
Bedford	78	25	57.8	1.70	
Bloomington	76	28	56.4	1.08	T.
Bluffton	79	21	53.0	2.14	T.
Boonville	80	23	55.7	1.68	T.
Cambridge City	78	21	52.0	2.27	
Columbus	80	23	54.6	1.46	
Connersville	78	21	54.1	1.95	T.
Delphi	79	20	52.0	2.35	T.
Elkhart	79	20	53.2	2.12	3.0
Farmersburg	79	23	55.6	2.04	
Farmland	75	23	52.4	3.57	T.
Fort Wayne	78	24	51.8	2.93	T.
Franklin	80	23	55.0	1.56	T.
Greenfield	77	24	54.8	1.84	
Greensburg	80	23	55.2	1.60	T.
Hammond	76	27	54.8	1.67	T.
Holland	85	24	57.8	2.59	T
Huntington	76	24	52.6	3.26	0.5
Jeffersonville	83	27	57.6	1.12	T.
Knox	77	21	52.3	2.70	14.3
Kokomo	78	21	51.4	2.06	T.
Lafayette	80	20	52.6	1.90	T.
Laporte	79	8	48.6	3.56	9.0
Lima	78	20	49.8	2.02	0.2
Logansport	83	22	54.7	2.18	T.
Madison	82	27	56.8	1.15	T.
Marengo	79	24	55.6	0.38	T.
Marion	80	22	53.4	3.08	T.
Markle	78	21	52.2	3.45	T.
Mauzy	79	19	53.7	2.13	T.
Moores Hill	76	24	54.5	1.45	0.1
Mount Vernon	89	29	58.9	2.95	
Northfield	75	19	51.4	2.38	
Paoli	79	22	56.2	1.10	T.
Plymouth	77	16	51.4	2.47	6.0
Princeton	82	26	57.0	1.48	
Rensselaer	80	20	52.8	1.79	T.
Richmond	77	23	53.4	1.76	T.
Rochester	72	24	52.0	2.13	7.0
Rockville	78	23	54.4	1.28	T.
Rome	87	26	58.9	1.17	T.
Salamonia	75	27	52.8	1.98	T.
Salem	77	23	55.4	0.66	T.
Scottsburg	79	27	56.6	1.23	1.0
Seymour	79	30	55.6	1.34	
Shelbyville	77	24	54.6	1.44	T.
South Bend	78	12	50.6	3.77	13.0
Syracuse	77	21	51.0	2.64	1.0
Terre Haute	78	26	56.6	1.54	
Veedersburg	79	20	54.0	0.79	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Indiana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Vevay	78	28	56.2	1.15	1.0
Vincennes	84	28	56.7	1.95	
Washington	80	24	55.4	1.39	
Worthington	80	20	55.1	0.81	T.
Indian Territory.					
Ardmore	87	30	59.2	2.50	
Calvin				1.52	
Durant	87	33	58.6	2.21	
Fairland	87	26	58.2	0.84	
Fort Gibson				1.75	
Hartshorne	85	26	56.6	1.75	
Healdton	87	24	58.8	1.39	
Holdenville	86	30	58.5	1.55	
Marlow	86	31	57.4	2.79	
Muskogee	85	29	58.9	1.35	
Okmulgee	85	27	57.6	1.00	
Pauls Valley	87	24	57.6	2.15	
Ravia	87	34	60.2	2.19	
South McAlester	87	31	61.4		
Tulsa	88[f]	30[e]	58.4[f]	1.49	
Vinita	86	25	57.4	1.24	
Wagoner	87[e]	26[e]	58.0[e]	1.26	
Webbers Falls	89	25	57.8	1.63	
Iowa.					
Afton	79	19	52.2	1.48	
Albia	83	22	51.8	0.56	
Algona	75	22	48.3	2.62	T.
Allerton	83	21	53.4	0.50	
Alta	76	21	48.6	3.52	0.5
Alton	76	22	48.8	3.82	T.
Amana	79	19	51.1	1.91	
Ames	87	19	51.0	1.72	
Atlantic	83	16	50.4	1.15	
Audubon	80	16	49.6	1.50	
Baxter	81	18	51.7	1.39	
Bedford	87	19	52.9	1.54	
Belleplaine	81	22	50.9	2.03	
Bloomfield	81	20	53.1	1.22	
Bonaparte	81	22	53.4	1.20	
Boone	79	22	50.8	1.89	T.
Britt	75	21	48.2	2.55	
Buckingham				1.97	
Burlington	82	24	53.0	1.51	
Carroll	77	19	48.6	1.68	
Cedar Rapids	83	20	50.6	1.11	T.
Chariton	83	20	53.6	0.84	
Clarinda	84	20	52.7	1.12	
Clearlake	75	20	49.7	1.86	
Clinton	76	19	50.9	1.41	
College Springs	83[4]	22[4]	53.8[4]	2.10	
Columbus Junction	78	22	53.0	1.51	
Corning	77	19	51.0	0.98	
Corydon	83	21	53.8	0.63	
Creston	80	19	50.2	1.05	
Cumberland				1.16	
Decorah	77	19	49.2	2.24	T.
Delaware	78	18	49.8	1.46	
Denison	79	19	50.2	1.66	
Desoto	82	19	52.3	1.24	
Dows	78	18	49.0	2.65	T.
Earlham	80	14	50.6	1.34	
Elkader	81	7	45.0	1.81	
Elliott	78	18	51.4	0.57	
Estherville	77	19	46.8	3.90	T.
Forest City	78	22	48.4	2.41	
Fort Dodge	78	24	48.4	2.49	
Fort Madison				0.60	
Galva	74	18	47.6	2.92	
Gilman				1.67	
Grand Meadow	76	20	49.0	1.83	
Greenfield	77	19	50.8	1.42	T.
Grinnell (near)	82	21	51.6	1.86	
Grundy Center	80	20	50.2	2.37	
Guthrie Center	78	18	50.4	1.55	
Hampton	78	22	51.0	1.25	
Hancock	75	23	50.4	0.89	
Harlan	77	17	49.4	1.27	
Hopeville	81	21	52.8	1.18	
Humbolt	77	24	50.2	2.39	
Indianola	80	23	52.2	2.33	
Inwood	77	18	48.4	3.25	
Iowa City	84	19	51.6	1.48	
Iowa Falls	77	20	49.0	1.83	T.
Jefferson	80	21	51.6	1.56	
Keosauqua	80	18	51.6	1.34	
Knoxville	80	21	53.0	1.33	
Lacona				0.76	
Larrabee	74	20	48.2	4.25	T.
Leclaire				1.47	
Lemars	75	21	49.2	3.60	T.
Lenox	77	21	52.0	1.47	
Leon	78	22	52.6	0.70	
Little Sioux	81	19	51.4	2.44	
Logan	78	19	50.2	2.46	
Maple Valley				3.51	
Marshalltown	83	18	49.9	2.07	
Mason City	74	25	49.8	1.75	
Massena	85	17	51.8	0.88	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mountayr	85	21	53.8	1.40	
Mount Pleasant	78	22	53.2	1.12	
Mount Vernon	82	20	52.4	1.06	T.
Muscatine				1.75	
Nevada				1.60	
New Hampton	76	20	48.7	2.03	T.
Newton	79	30	53.8	1.57	
Northwood	73	20	47.4	2.29	T.
Odebolt	81	21	50.8	2.99	
Olin	76	17	50.8	1.35	
Onawa	81	24	52.6	4.21	T.
Osage	74	20	48.0	2.33	
Oskaloosa	82	19	52.8	1.26	
Ottumwa	82	22	53.6	1.66	
Pacific Junction	79	19	50.6	1.28	
Pella	84[c]	21[c]	53.2[c]	1.38	
Perry	81	21	51.1	1.74	
Plover	77	20	47.8	3.92	1.0
Pocahontas	77	22	50.0	4.15	2.0
Preston	74	17	49.6	1.68	
Ridgeway	80	21	50.8	2.75	T.
Rock Rapids	70	20	43.0	3.43	3.0
Rockwell	75	21	49.4	1.90	
Sac City	75	20	48.2	2.36	
St. Charles	85	20	54.4	0.93	
Sheldon	80	20	49.2	3.81	T.
Sibley	76[c]	20	46.8[c]	3.12	0.5
Sigourney	83	21	53.5	1.70	
Sioux Center	76	21	48.2	3.17	T.
Stockport	81	20	54.0	1.42	
Stuart	78	24	51.0	1.36	
Thurman	78	22	51.4	1.29	
Tipton	79	25	53.5	1.55	
Toledo	79	19	51.0	1.98	
Wapello		25[4]	50.8[4]	1.44	
Washington	80	22	52.6	1.51	
Washta	80	14	49.4	3.27	T.
Waterloo	83	20	51.1	2.25	T.
Waukee	79[c]	22[c]	52.0[c]	1.29	T.
Waverly	79	22	50.5	2.03	T.
Webster City	78	19	50.2	2.37	
Westbend	75	21	48.0	2.93	T.
Whitten	79	21	50.2	1.74	T
Wilton Junction	73	20	51.9	1.90	
Winterset	78	23	51.8	1.07	
Woodburn	85	9	50.0	1.26	
Zearing	82	17	50.6	1.81	
Kansas.					
Abilene				2.34	
Alton	91	19	53.0	3.05	
Anthony	90	26	58.8	2.48	
Atchison	86	26	56.0	0.39	
Baker	85	26	54.4	0.45	
Burlington	90	23	57.3	1.11	
Chapman	90	22	54.6	1.70	
Cimarron	84	22	53.6	2.67	
Clay Center	85	18	52.8	2.77	
Colby	90	19	50.6	1.92	2.8
Coldwater	85	26	54.4	2.85	
Columbus	85	26	55.8	1.00	
Coolidge	92	17	49.0	1.85	T.
Cottonwood Falls	88	20	55.1	1.12	
Cunningham				2.80	
Dresden	91	21	51.0	2.78	T.
Eldorado	84	23	55.4	0.69	
Ellinwood	85	26	53.4	3.49	
Ellsworth	88	22	54.8	2.83	
Emporia	90	27	56.4	0.91	
Englewood				2.64	
Enterprise	87	22	54.6	1.14	
Eskridge	87	31	55.8	0.71	
Eureka				0.92	
Fall River	87[c]	24[c]		0.54	
Farnsworth	93	21	52.4	2.47	T.
Fort Scott	89	25	59.0	1.40	
Frankfort	88	20	53.9	2.38	
Fredonia	88	24	56.4	0.75	
Garden City	92	24	52.2	3.46	T.
Garnett	88	25	56.1	0.70	
Goodland	90	21	52.2	1.57	8.5
Gove[e1]	84	23	53.4	2.76	
Grenola	85	27	55.6	0.80	
Hanover	86	22	53.5	2.10	
Harrison	88	20	51.6	2.95	
Hays	87	22	52.0	2.94	
Horton	86	26	54.7	0.66	
Hoxie	87	22	50.6	3.20	
Hugoton	90	23	53.8	2.05	T.
Hutchinson	88	24	54.5	1.72	
Independence	88	29	57.6	1.08	
Jetmore	89	22	52.6	2.24	
Jewell	89	20	53.0	1.93	
La Crosse	84[c]	22[c]	51.6[c]	2.68	
Lakin	88	23	51.0	2.28	T.
Larned	87	19	51.8	2.68	
Lebanon	86	25	53.7	2.50	
Lebo	87	26	55.3	1.01	
Macksville	84	23	53.0	4.01	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
McPherson	89	25	54.8	2.44	
Madison	90	23	56.1	1.22	
Manhattan[b]	90	22	55.8	0.83	
Manhattan[c]	91	20	54.4	0.72	
Medicine Lodge	93	23	56.1	3.90	
Minneapolis	89	24	52.1	3.62	
Moran	89	25	57.0	0.89	
Mounthope				1.87	
Neosho Rapids				1.09	
Ness City				3.30	
Newton	87	22	56.1	1.24	
Norton	92	20	50.8	3.27	
Norwich	86	26	56.4	2.11	T.
Oberlin				3.40	3.0
Olathe	88	26	56.0	0.30	
Osage City	90[c]	23[c]	55.1[c]	0.82	
Oswego	88	25	56.6	0.80	
Ottawa	93	21	56.4	0.69	
Paola	93	25	58.1	0.48	
Phillipsburg	92	23	53.2	3.52	
Plainville				3.90	
Pleasanton	87	26	56.6	0.72	
Pratt	88	25	55.6	3.50	
Republic	85	26	51.6	2.16	
Rome	88	24	56.1	1.69	
Russell	86[c]	24	53.9	2.64	
Salina	86	19	54.9	3.03	
Scott	92	29	52.9	1.99	T.
Sedan	87	29	57.2	0.95	
Toronto	88	22	55.9	0.55	
Ulysses	94	21[c]	53.5[c]	2.01	T.
Valley Falls	88	23	55.2	0.32	
Wakeeney	89	22	52.3	4.15	
Wakeeney (near)				5.11	
Wallace	92	18	51.1	1.59	3.0
Walnut	88	28	57.6	0.82	
Winfield	83	22	57.0	0.88	
Yates Center	89	25	58.0	0.64	
Kentucky.					
Alpha	86	28	58.8	3.18	T.
Anchorage	82	21	55.2	0.93	T.
Bardstown	91	23	57.3	0.67	T.
Beattyville	88	25	56.7	2.43	T.
Beaver Dam	88	27	56.8	1.48	
Berea				1.55	T.
Blandville	80	29	57.1	1.64	
Bowling Green	86	29	57.7	1.20	
Burnside				2.36	T.
Cadiz	85	27	58.2	2.11	
Calhoun	86	27	58.6	2.66	
Catlettsburg	81	26	57.2	2.32	T.
Earlington	82	26	59.9	1.61	
Edmonton	87	23	55.6	2.28	T.
Eubanks	86	29	55.3	1.91	
Falmouth				1.05	
Frankfort	78	28	56.8	0.80	
Franklin	85	26	57.6	3.91	
Greensburg	85	23	54.8	1.97	T
High Bridge	94	30	61.0	0.83	
Hopkinsville	88	24	57.1	2.21	
Irvington	81	25	57.0	0.83	T.
Jackson	86	32	59.5	2.30	T.
Leitchfield	83	26	57.3	1.85	
Loretto	87	23	58.8	0.53	T.
Lynnville	85	27	58.3	3.33	
Marion	85	30	58.4	2.01	
Maysville	85	24	55.6	1.32	T.
Middlesboro	85	25	57.3	1.85	
Mount Sterling	89	26	58.8	2.16	0.2
Owensboro	85	30	58.8	2.50	
Owenton	76	28	55.5	1.17	T.
Paducah	85	32	60.2	2.20	
Princeton[j]	87	25	58.0		
Richmond	85	24	57.6	1.57	
St. John	85	22	54.9	0.94	
Scott	79	24	55.5	1.25	0.2
Shelby City	86	23	55.8	2.05	T.
Shelbyville	82	25	56.0	1.50	T.
Taylorsville	80	26	56.4	0.70	T.
West Liberty	87	24	56.8	2.11	0.5
Williamsburg	90	24	56.1	1.40	T.
Williamstown	80	25	54.9	1.00	T.
Louisiana.					
Abbeville	83	39	64.8	5.78	
Alexandria	91	35	63.8	5.37	
Amite	83	34	63.3	3.44	
Baton Rouge	91	36	64.4	3.21	
Burnside	83	35	64.6	2.05	
Calhoun				2.60	
Cameron	82	45	67.6	9.76	
Cheneyville	87	33	63.3	6.56	
Clinton	82	35	63.6	4.32	
Collinston	91	36	61.8	3.52	
Covington	83	33	63.0	0.50	
Crowley	84	40	65.3	6.90	
Donaldsonville	88	40	67.6	2.86	
Farmerville	86	38	62.8	2.17	
Franklin	85	39	65.7	5.00	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Louisiana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Grand Coteau	88	39	65.3	6.01	
Houma	83	36	65.0	1.27	
Jennings	87	40	64.7	6.36	
Lafayette	87	39	64.1	5.27	
Lake Charles	92	38[c]	64.9	10.60	
Lakeside	85	39	65.8	6.62	
Lawrence	88	47	68.8	3.06	
Libertyhill	85	33	61.3	2.49	
Logansport				4.95	
Mansfield	85	37	61.4	4.33	
Melville	92	36	63.8	5.35	
Minden	85	36	60.0	3.07	
Monroe				3.80	
Morgan City				4.18	
New Iberia	82[c]	44[c]	66.8[c]	3.85	
Opelousas	89	31	62.4	4.40	
Pearl River				1.50	
Plain Dealing	86	34	60.8	3.19	
Rayne	86	39	65.0	4.77	
Robeline	86	32	60.6	3.15	
Ruston	86	39	61.5	3.50	
St. Francisville	94	42	65.7	6.25	
Schriever	89	33	64.7	2.70	
Simmesport				4.08	
Southern University				0.83	
Sugar Experiment Station	83	42	67.0	1.59	
Sugartown	83	39	63.5	8.79	
Maine.					
Bar Harbor	68	24	48.0	4.40	
Cornish	76	24	48.4	4.32	T.
Danforth				4.73	
Debsconeag	73	27	47.6	7.43	T.
Fairfield	71	25	47.8	5.38	
Farmington	74	23	47.4	4.84	T.
Gardiner	73	25	48.7	5.73	T.
Greenville	71	21	45.0	5.80	T.
Lewiston	75	29	50.0	4.97	T.
Madison	69	22	45.9	6.14	0.5
Mayfield	66	26	45.2	5.54	T.
Millinocket	72	25	47.0	7.10	T.
North Bridgton	75	25	49.1	5.18	T.
Oquossoc	66	24	43.0	4.08	
Orono	73	23	48.6	4.90	0.5
Patten	70	20	46.2	10.10	
Rumford Falls	74	24	47.8	4.79	T.
The Forks				5.98	
Vanburen	75	22	45.4	6.30	
Winslow	73	21	47.9	5.86	T.
Maryland.					
Annapolis	80	31	58.4	3.92	
Bachmans Valley	78	26	54.8	6.52	T.
Cambridge	78	32	58.2	5.17	
Cheltenham	77	29	55.6	6.11	
Chestertown	75	34	56.4	3.49	
Chewsville	77	23	53.0	4.86	
Clearspring	79	26	52.6	6.08	T.
Coleman	79	35	57.6	5.90	T.
Collegepark	81	23	56.4	4.04	
Cumberland	81	21	53.3	2.77	
Darlington	76	29	55.0	5.50	T.
Deerpark	73[c]	12[c]	48.4[c]	2.69	3.0
Easton	77	31	57.0	3.41	
Fallston	77	30	54.6	6.56	
Frederick	80	28	55.0	5.18	
Frostburg				3.36	T.
Grantsville	76	18	48.8	1.98	2.0
Great Falls	81	25	56.0	8.47	
Greenspring Furnace	77	24	53.7	6.00	
Harney				4.93	
Jewell	78	29	56.1	5.00	
Johns Hopkins Hospital				6.02	
Keedysville	81	24	55.4	5.31	
Lake Montebello	80	30	55.8	6.94	
Laurel	80	25	55.6	5.22	
Monrovia	77	26	54.0	6.25	
Mount St. Marys College	79	29	54.6	8.86	T.
Oakland	75	15	49.3	2.35	2.0
Pocomoke City	79	32	58.9	4.18	
Porto Bello	79	33	59.3	9.02	
Princess Anne	78	27	58.0	4.36	
Salisbury	78	25	58.3	5.47	
Solomons	80	37	58.7	4.23	
Sudlersville	80	30	56.6	4.78	
Takoma Park	76	28	55.3	5.55	
Taneytown	77	24	53.6	5.09	
Van Bibber	76	30	55.3	5.04	
Westernport	80	22	53.3	1.80	T.
Woodstock	76	31	56.6	7.79	
Massachusetts.					
Amherst	78	24	51.4	5.69	
Bedford	70	28	50.2	2.27	
Bluehill (summit)	70	31	50.9	4.22	T.
Cambridge	72	30	52.6	3.09	
Chestnuthill	74	28	52.8	3.71	
Concord	72	23	49.6	2.55	
Fallriver	72	35	52.8	3.76	
Fitchburg	72	28	50.0	3.81	T.
Framingham	73	22	49.7	3.11	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Massachusetts—Cont'd.	°	°	°	*Ins.*	*Ins.*
Groton	71	23	48.4	2.67	
Hyannis				1.91	
Jefferson				4.73	
Lawrence	71	28	51.0	2.11	
Leominster				3.64	
Lowell	74	27	52.4	2.35	
Middleboro	76	24	51.3	2.91	
Monson	72	24	50.0	5.47	T.
New Bedford	72	38	54.6	3.11	
Plymouth	75	34	53.1	4.01	
Princeton				3.85	
Provincetown	70	36	54.0	3.04	
Salem				3.40	
Somerset	79	27	53.1	3.64	
Sterling				4.03	
Taunton	72	22	51.7	4.30	
Webster				4.28	
Westboro	74	23	51.6	3.61	
Weston	71	24	49.4	2.76	
Williamstown	72	25	49.9	3.18	0.8
Winchendon				3.53	
Worcester	71	33	51.6	3.39	T.
Michigan.					
Adrian	80	22	51.1	2.37	
Agricultural College	75	16	49.2	2.36	2.0
Allegan	78[d]	18[c]	51.2[c]	2.72	2.0
Alma	76	15	48.4	3.13	6.0
Ann Arbor	75	24	52.2	3.03	T.
Arbela	76	23	50.4	3.63	3.0
Ball Mountain	75	23	49.4	5.67	2.8
Battlecreek	81	18	50.3	2.54	1.0
Bay City	73[g]	22	48.3[d]	4.10	2.0
Benzonia	78	23	47.6	2.45	T.
Berlin	74	23	48.6	4.99	5.0
Big Rapids	79	20	47.6	4.66	3.0
Birchwood	78	17	51.4	3.20	8.0
Blaney	74	16	44.6	4.10	3.7
Bloomingdale	80	20	51.6	2.60	4.5
Calumet	75	20	44.8	3.91	1.0
Cassopolis	76	14	51.4	3.90	12.0
Charlevoix	74	25	49.6	1.92	T.
Charlotte	82	15	49.0	2.30	4.0
Chatham	79	16	43.7	4.04	5.0
Cheboygan	89	24	50.4	1.89	T.
Clinton	75	21	49.7	2.13	0.6
Coldwater	79	19	51.2	1.94	
Concord	74	18	48.4	2.18	0.5
Deer Park	79	21	46.4	1.89	3.0
Detour	68	25	45.6	3.26	T.
Dundee	75	22	50.7	2.74	T.
Eagle Harbor	78	22	46.7	2.70	T.
East Tawas	68[c]	21[c]	47.2[c]	3.08	T.
Flint	75	23	48.8	3.44	3.0
Frankfort	75	28	49.4	2.92	7.0
Grand Marais	80	28	47.5	2.19	T.
Grape				3.46	T.
Grasslake	75	19	49.2	2.21	2.0
Grayling	80	15	45.8	2.50	2.0
Hagar	73	4	48.6	4.21	10.0
Harbor Beach	71	26	50.2		
Harrison	77	18	47.1	2.40	3.0
Harrisville	73	23	47.8	3.99	1.0
Hayes	76	26	50.2	3.72	5.0
Highland				4.10	4.0
Hillsdale	73	18	48.8	3.12	0.5
Howell	75	19	49.5	3.27	1.2
Humboldt	72	1	41.4	3.55	3.0
Iron Mountain	78	17	44.8	3.09	T.
Iron River	80	7	42.4	6.00	1.0
Ironwood	77	17	44.4	1.48	2.0
Ishpeming	78	8	41.1	2.95	8.0
Ivan	81	9	46.6	2.65	10.0
Jackson	77	19	50.4	2.62	T.
Jeddo	74	26	50.2	5.04	5.5
Kalamazoo	75	20	49.3	2.63	3.0
Lansing	76	17	49.6	2.53	4.0
Ludington	75[d]	20[d]	49.0[d]	7.64	8.5
Mackinac Island	72	20	44.8	4.35	1.0
Mackinaw	69	28	47.8		
Mancelona	77	12	46.6		0.5
Manistee	78	15	48.5		
Maple Ridge	72	12	42.8	4.75	10.0
Marlboro	78	13	47.1	2.76	1.5
Menominee	73	19	47.8	2.83	T.
Mio	80	15	45.4	2.16	3.5
Montague	79	21	50.7	5.18	6.0
Mount Clemens	74	25	49.4	4.13	T.
Mount Pleasant					1.5
Muskegon	76	25	49.5	3.30	3.0
Newberry				2.00	2.0
Old Mission	80[f]	24[f]	49.6[f]	2.67	6.0
Olivet	72	17	47.7	4.20	5.0
Omer	76	11	47.0	2.87	1.5
Owosso	76	15	49.8	3.99	T.
Petoskey	81[i]	23[i]	49.5[i]	2.62	0.5
Plymouth	76	20	49.1	5.55	0.5
Pontiac	77[d]	23	50.2	3.58	2.0
Port Austin	75	27	50.8		

Stations.	Temperature. (Fahrenheit.)			Precipitation	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Reed City	78	19	47.6	4.25	5.0
Saginaw (W. S.)	78	22	50.2	3.49	3.7
St. James	69	24	48.8	2.11	T.
St. Johns	78	14	49.9	2.88	2.6
St. Joseph	78	20[h]	50.5[d]	3.44	5.0
Saranac	80	11	49.2	2.20	4.0
Slocum	77	18	48.4	4.01	
Somerset				2.70	1.0
South Haven	76	15	48.6	2.93	12.0
Stanton	76	15	47.3	3.31	3.1
Thomaston	77	8	43.7	3.12	1.0
Thornville	81	22	50.0	7.08	5.0
Traverse City	79	26	50.0	3.23	3.5
Vassar	75	25	49.0	5.50	3.0
Wasepi	75	19	49.1	3.02	1.0
Webberville	76	18	48.2	4.46	2.5
West Branch					3.0
Wetmore	80	15	44.1	2.05	4.5
Whitefish Point	72	25	46.2	2.85	0.9
Woodlawn	81	17	44.0	2.37	3.0
Ypsilanti	76	21	50.0	3.64	0.5
Minnesota.					
Albert Lea	78	23	47.9	2.32	T.
Alexandria	78	18	45.4	2.69	
Amboy	80	22	49.0	2.73	2.0
Angus	78	−1	42.0	1.11	6.2
Ashby	74	21	45.0	2.62	
Bagley	81	−1	42.6	1.43	12.0
Beardsley	85	10	42.2	0.85	2.0
Beaulieu	80	9	44.2	0.61	8.0
Bird Island	77	22	47.0	2.44	T.
Caledonia	74	21	48.2	2.61	T.
Cass Lake				1.73	4.0
Collegeville	75	20	45.4	2.45	0.2
Crookston	79	9	43.4	1.11	5.0
Detroit	76	11	41.2	2.11	3.5
Fairmount	72	24	47.1	3.95	1.0
Faribault	78	21	49.6	2.92	T.
Farmington	75	21	46.4	2.14	4.0
Fergus Falls	81	22	46.6	2.47	9.7
Fort Ripley	80	20	45.8	3.68	3.5
Glencoe				1.20	1.5
Grand Meadow	77	24	48.2	2.43	T.
Hallock	79	2	42.0	0.45	2.0
Halstead	82	12	43.4	0.71	T.
Hinckley	77	15	44.9	3.13	3.0
Howland	50	20	37.8	1.59	
Leech	78	8	42.8	2.58	11.5
Little Falls	77	20	45.6	3.10	
Long Prairie	78	15	45.6	2.51	1.0
Luverne	73	22	45.8	2.68	1.0
Lynd	80	21	47.6	3.99	3.0
Mankato				2.61	
Milaca	76	22	44.4	3.24	
Milan	79	20	46.7	2.85	T.
Minneapolis [1]	78	22	46.5	2.07	1.0
Montevideo	79	23	46.9	2.90	
Mora	76	14	44.3	3.56	4.5
Morris	82	21	45.5	1.96	
Mount Iron	77	7	42.1	1.28	9.0
New London	82	20	45.8	2.60	
New Richland	78	24	49.6	2.19	T.
New Ulm	82	25	49.7	0.88	2.0
Park Rapids	80	7	43.6	1.42	10.8
Pine River	78	8	45.4	2.77	5.0
Pipestone	73	19	47.4	2.90	
Pokegama Falls	85	5	44.1	2.13	8.0
Redwing				2.44	
Redwood Falls	81	24	48.4	2.03	T.
Reeds				1.46	
St. Charles	78	23	48.8	3.58	
St. Cloud	77	19	45.7	3.22	0.5
St. Peter	75	15	44.0	1.85	
Sandy Lake Dam	79	14	45.6	2.43	4.5
Shakopee	76	21	47.6	2.80	
Stillwater				1.78	
Taylors Falls	76	22	48.0	2.90	T.
Tonka				1.77	
Two Harbors	76	16	44.0	3.59	T.
Wabasha	82	22	50.6	2.35	T.
Wadena	77	12	43.8	2.60	11.0
Willow River	79	11	42.1	2.36	2.1
Winnebago	79	23	47.8	2.88	3.8
Winona	76	21	47.6	2.19	1.5
Worthington	71	21	46.2	1.21	
Mississippi.					
Aberdeen	88	30	61.6	2.95	
Agricultural College	85	31	61.0	3.01	
Austin	87	32	59.2	2.67	
Batesville	88	32	60.6	2.69	
Bay St. Louis	87	45	66.2	1.64	
Bellefontaine	85	31	60.5		
Biloxi	89	44	67.6	1.42	
Booneville	81	31	58.4	5.28	
Brookhaven	85	31	61.8	6.20	
Canton	84	32	62.0	4.49	
Columbia				3.70	
Columbus	86	30	60.8	3.16	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Mississippi—Cont'd.	°	°	°	*Ins.*	*Ins.*
Corinth	80	33	58.4	6.41	
Crystal Springs	88	37	62.3	6.20	
Duck Hill	87	33	62.1	2.38	
Edwards	85	33	63.4	4.83	
Enterprise	.....	.....	.....	5.17	
Fayette	82	35	60.5	4.71	
Fayette (near)	.....	.....	.....	5.47	
Greenville	86	35	60.9	3.65	
Greenwood	87	34	60.4	3.36	
Hattiesburg	85	34	63.6	1.08	
Hazlehurst	84	35	62.4	6.75	
Hernando	86	31	58.2	1.65	
Holly Springs	81	32	57.8	2.24	
Indianola	82	33	58.1	3.19	
Jackson	83	34	62.1	5.09	
Kosciusko	86	32	61.0	4.49	
Lake	84	30	60.4	4.59	
Lake Como	.....	30[e]	62.1	3.75	
Laurel	85	32	63.0	2.63	
Leakesville	88[c]	32	63.4	1.22	
Louisville	86	31	61.6	3.91	
McNeill	85	38	64.3	0.78	
Macon	86	30	60.4	4.49	
Magee	86	31	62.2	4.27	
Magnolia	84	33	63.7	3.87	
Merrill	.....	.....	.....	2.76	
Natchez	84	38	62.2	4.85	
Okolona	86	31	60.2	2.75	
Pearlington	85	37	65.1	1.66	
Pecan	88	40	65.6	0.46	
Pittsboro	84	29	59.5	2.79	
Pontotoc	84	35	59.5	3.35	
Porterville	82	29	60.8	3.95	
Port Gibson	84	30	60.4	6.39	
Quitman	85	30	61.8	3.98	
Ripley	87	26	60.3	3.67	
Shoccoe	84[d]	36[d]	62.4[d]	5.42	
Shubuta	.....	.....	.....	5.47	
Stonington	.....	.....	.....	5.39	
Suffolk	85	34	63.0	6.82	
Tchula	86	30	61.7	2.94	
Tupelo	87	29	60.2	2.64	
University	86	31	61.3	2.72	
Utica	85	34	63.4	4.76	
Walnutgrove	82[d]	32[d]	61.4[d]	6.03	
Watervalley	86	31	60.6	2.23	
Waynesboro	84	31	60.6	5.52	
Woodville	81	40	62.8	5.72	
Yazoo City	85	37	61.2	3.98	
Missouri.					
Appleton City	89	25	56.2	0.68	
Arthur	94	23	57.4	0.65	
Avalon	90	23	56.8	0.42	
Belle	82	24	57.5	1.08	
Bethany	79	17	51.6	0.57	
Bolivar	80	25	54.8	0.19	
Boonville	.....	.....	.....	0.40	
Brunswick	88	26	56.0	0.44	
Caruthersville	89	30	59.0	1.46	
Clinton	87[f]	26[f]	56.3[f]	0.55	
Conception	85	25	54.6	0.64	
Darksville	86	24	58.7	0.50	
Dean	92	24	57.6	0.91	
De Soto	83	27	57.7	1.88	
Doniphan	82	27	56.4	0.90	
Eldorado Springs	89	25	57.7	0.92	
Fairport	.....	.....	.....	0.45	
Fayette	84	26	57.2	0.36	
Fulton	87	24	57.8	0.36	
Gads Hill	80	21	56.4	0.65	
Gallatin	88	28	58.5	0.52	
Gano	84	24	56.8	1.14	
Glasgow	.....	.....	.....	0.26	
Goodland	81	22	55.4	1.72	
Gorin	.....	.....	.....	0.74	
Grant City	81	23	54.4	1.28	
Harrisonville	89	26	54.2	0.39	
Hazlehurst	.....	.....	.....	0.50	
Hermann	.....	.....	.....	0.83	
Huntsville	.....	.....	.....	0.45	
Houston	81	28	55.4	2.14	
Ironton	83	21	55.4	1.82	
Jackson	84	37	59.4	2.99	
Jefferson City	86	24	54.8	0.49	
Joplin	88	29	58.8	1.06	
Kidder	91	23	54.4	0.42	
Koshkonong	82	29	57.9	2.08	
Lamar	87	26	56.7	0.76	
Lamonte	.....	.....	.....	0.48	
Lebanon	80	28	55.6	1.52	
Lexington	90	26	56.9	0.41	
Liberty	87	28	54.0	0.50	
Lockwood	84	27	55.0	0.99	
Louisiana	82	20	54.9	1.17	
Macon	84	25	55.6	0.55	
Marblehill	83	26	58.2	1.60	
Marshall	86	23	56.5	0.82	
Maryville	85	24	52.6	0.88	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mexico	85	22	54.4	0.52	
Monroe	81	23	54.1	0.49	
Mountain Grove	80	27	55.1	2.30	
Mount Vernon	85	26	55.7	0.56	
Neosho	84	28	56.3	1.04	
New Madrid	.....	.....	.....	1.97	
Oakfield	83	27	57.4	1.28	
Olden	81	23	55.8	2.75	
Oregon	79	26	54.0	0.78	
Princeton	81	22	55.8	0.42	
Rockport	.....	.....	.....	1.71	
Rolla	.....	.....	.....	1.20	
St. Charles	82	29	57.3	1.78	
St. Joseph	.....	.....	.....	0.20	
Sarcoxie	.....	.....	.....	0.96	
Sedalia	84	26	56.2	0.61	
Seymour	82	26	53.3	1.77	
Sikeston	84	28	58.2	0.55	
Steffenville	84	25	55.6	0.45	
Subiett	81	21	52.8	0.90	
Trenton	80	25	54.6	0.38	
Unionville	82	17	52.6	0.92	
Versailles	84	22	55.4	1.60	
Warrensburg	89	26	58.0	0.32	
Warrenton	78	25	54.2	1.00	
Warsaw	88	23	56.2	0.79	
Wheatland	.....	.....	.....	1.02	
Willowsprings	73	22	51.8	2.55	
Windsor	85	23	56.8	0.39	
Montana.					
Adell	75	2	45.0	1.18	7.0
Anaconda	77	14	45.4	0.71	
Augusta	76	2	45.0	0.41	4.5
Babb	70[m]	15[m]	43.8[m]	1.54	5.3
Bear Creek	77[f]	17[f]	44.3[f]	6.46	2.5
Billings	91	16	51.6	0.69	T.
Bozeman	76	17	45.7	1.35	2.0
Boulder	80	10	46.6	T.	
Butte	72	16	43.4	0.10	
Canyon Ferry	77	15	46.5	0.41	
Chester	78[e]	15[e]	45.2[e]	0.60	
Chinook	82	21	48.6	0.56	
Choteau	79	16	48.6	0.09	
Clear Creek	74	22	46.8	0.90	2.0
Columbia Falls	85	19	45.5	0.92	T.
Copper	.....	.....	.....	0.34	1.0
Crow Agency	87	13	49.0	0.60	
Culbertson	81	15	45.3	0.28	
Dayton	74	23	45.4	1.13	
Decker	82	14	52.0	1.10	
Dillon	86	17	50.2	0.21	T.
Ekalaka	89	10	47.2	0.45	T.
Evans	80	10	48.6	0.74	T.
Fallon	88	14	47.4	T.	
Forsyth	90	11	49.3	0.36	
Fort Benton	82	20	50.0	0.83	
Fort Harrison	79	14	46.8	.....	
Fortine	73	12	44.0	0.78	T.
Gold Butte	.....	.....	.....	1.05	6.5
Graham	84[e]	12	46.0[e]	0.58	T.
Grayling	70[j]	— 9[j]	35.0[j]	0.61	6.0
Greatfalls	78	22	49.6	1.07	T.
Hamilton	78	21	47.6	0.72	
Homepark	.....	.....	.....	0.73	
Huntley	88	20	50.7	0.66	
Jordan	91	14	47.4	0.00	
Lame Deer	88	7	49.3	0.68	T.
Lewistown	83	15	47.2	0.95	0.5
Livingston	83[j]	22[j]	48.1[j]	1.07	1.0
Lodge Grass	86[j]	12[j]	47.1[j]	T.	T.
Malta	79[j]	19[j]	49.8[j]	0.50	
Marysville	72	14	43.9	0.99	3.5
Missoula	77[b]	22[b]	44.6[b]	1.50	
Nye	.....	.....	.....	1.07	13.5
Ovando	.....	.....	.....	1.54	4.0
Philipsburg	78	11	45.4	0.84	2.0
Plains	74[e]	22[e]	48.6[e]	1.51	
Plentywood	85	13	47.4	0.00	
Polson	74[e]	22[e]	49.2[f]	.....	
Poplar	82	17	47.4	0.25	
Raymond	.....	.....	.....	1.26	
Redlodge	78	— 2	43.6	1.44	4.2
Renovo	80	13	47.4	0.50	
St. Peter	74	25	48.7	1.11	6.0
Saltese	.....	.....	.....	3.75	
Springbrook	83	12	48.2	T.	
Steele	80	23	52.2	1.08	
Tokna	83	18	48.8	0.05	
Townsend	.....	.....	.....	0.10	
Toston	78	13	46.0	0.19	T.
Troy	76	21	47.6	2.05	
Utica	77	16	47.4	0.70	3.0
Warrick	73[b]	20[b]	44.0[b]	1.09	1.2
Wolf Creek	83	10	48.3	0.38	
Wolf Point	.....	.....	.....	0.25	
Nebraska					
Agate	84	10	43.8	1.05	12.0
Ainsworth	86	11	46.4	3.97	22.5

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Albion	.....	.....	.....	3.27	
Alliance	86	21	45.5	3.30	24.0
Alma	90	16	49.7	2.81	
Anoka	.....	.....	.....	3.50	4.0
Arapaho	.....	.....	.....	3.20	
Arcadia	.....	.....	.....	3.40	T.
Ashland	84	22	53.4	2.05	
Ashton	.....	.....	.....	2.49	T.
Atkinson	85	16	46.6	2.66	.....
Auburn	83	21	53.5	1.43	
Aurora	88	18	54.4	3.65	
Beatrice	81	22	52.4	1.95	
Beaver	91	22	51.6	3.58	T.
Bellevue	79	23	53.0	1.58	
Blair	78	23	50.4	2.53	
Bluehill	.....	.....	.....	3.18	
Bradshaw	.....	.....	.....	5.14	
Bridgeport	93	13	46.5	2.50	18.0
Broken Bow	87	15	48.4	3.73	.....
Burchard	.....	.....	.....	1.94	
Burwell	.....	.....	.....	4.45	
Callaway	91	16	51.0	4.73	
Central City	.....	.....	.....	3.74	
Chester	.....	.....	.....	2.10	
Clearwater	85	16	48.9	3.57	T.
Columbus	86	19	48.6	3.75	
Crete	84	23	53.3	2.32	
Culbertson	85	26	48.0	2.74	3.5
David City	79	23	51.1	4.04	
Dawson	87	22	54.0	2.11	
Dubois	.....	.....	.....	2.24	
Duff	.....	.....	.....	2.15	14.0
Dunning	.....	.....	.....	2.25	12.0
Edgar	.....	.....	.....	2.51	
Ellis	.....	.....	.....	1.65	
Endicott	.....	.....	.....	1.80	
Ewing	.....	.....	.....	4.05	
Fairbury	86	22	53.6	2.11	
Fairmont	85	17	48.9	3.09	
Fort Robinson	87	21	46.1	2.79	14.0
Franklin	90	16	52.0	2.67	
Fremont	81	22	50.4	2.61	
Fullerton	.....	.....	.....	3.96	
Geneva	86	19	52.0	3.21	
Genoa (near)	83	25	50.8	3.20	
Gosper	.....	.....	.....	3.40	
Gothenburg	91	11	49.2	3.36	T.
Grand Island	87	18	51.7	3.26	
Grant	90	16	47.2	1.80	12.0
Greely	.....	.....	.....	3.21	
Guide Rock	.....	.....	.....	3.29	
Haigler	.....	.....	.....	1.00	5.0
Halsey	92	16	47.4	.....	.....
Hartington	83	20	49.8	4.60	
Harvard	83	17	48.3	3.58	
Hastings[a1]	83	30	52.0	2.28	
Hayes Center	90	22	50.6	2.45	8.0
Hay Springs	88	14	46.2	2.40	18.0
Hebron	87	20	51.5	1.81	
Hendley	.....	.....	.....	2.95	
Holbrook	89	18	47.8	3.10	T.
Holdrege	89	21	51.8	3.90	T.
Hooper	74	22	48.8	2.62	
Imperial	90	19	50.2[d]	2.47	22.0
Kearney	88	20	50.7	2.76	
Kennedy	89	18	46.9	3.35	24.0
Kimball	84	18	44.6	1.86	15.0
Kirkwood	90	13	48.2	2.22	
Leavitt	87	20	50.4	3.09	
Lexington	89	16	47.7	3.26	T.
Loup	85	15	47.8	2.61	
Lynch	94	14	49.2	4.04	
McCook	.....	.....	.....	1.93	1.5
McCool	.....	.....	.....	4.07	
Madison	80	19	49.5	3.33	
Marquette	.....	.....	.....	3.65	
Mason	.....	.....	.....	4.45	
Minden	88	16	49.4	2.95	T.
Monroe	.....	.....	.....	3.54	
Nebraska City	82	24	52.4	1.17	
Nemaha	.....	.....	.....	1.84	
Norfolk	82	17	48.9	3.31	
North Loup	81	16	48.8	2.82	
Oakdale	80	18	47.5	3.25	T.
Oakland	80	20	49.4	3.08	
Odell	.....	.....	.....	1.67	
Ord	.....	.....	.....	3.94	
Palmer	.....	.....	.....	3.20	
Palmyra[a1]	82	26	52.0	2.05	
Pawnee City	85	19	52.8	1.93	
Plymouth	84	20	53.3	1.95	
Purdum	90	15	47.4	3.20	20.0
Ravenna	88	15	49.6	2.70	T.
Redcloud	89	16	52.1	2.48	
Republican	.....	.....	.....	3.10	
Rulo	.....	.....	.....	1.85	
St. Libory	.....	.....	.....	3.04	
St. Paul	87	18	50.8	3.08	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Santee	88	19	51.6	4.61	
Schuyler				3.32	
Seward				3.15	
Smithfield				3.75	
Springview	84	14	50.5	2.86	20.5
Stanton	84	16	51.6	3.20	
Strang				3.08	
Stratton				1.37	10.0
Stromsburg				4.31	
Superior	91	22	54.4	2.46	
Syracuse				1.25	
Tablerock				1.53	
Tecumseh	88	20	52.2	1.40	
Tekamah	83	22	50.4	2.92	
Turlington	82	26	52.0	1.18	
University Farm	84	21	52.4	1.95	
Wahoo				2.68	
Wakefield	82	18	49.2	3.74	T.
Watertown				3.92	T.
Wauneta				2.00	16.0
Weeping Water				0.82	
Westpoint	81	18	50.6	3.72	
Wilber				1.14	
Wilsonville				2.65	0.5
Winnebago	80	7	47.8	4.30	T.
Wisner				5.03	
Wymore				1.60	
York	85	19	51.3	4.06	
Nevada.					
Amos	83	10	47.6	0.00	
Austin	80	20	49.8	0.30	T.
Battle Mountain	78	25	51.2	T.	
Carlin	80	20	46.1	T.	
Carson City	84	11	50.2	0.02	
Carson Dam	86	20	53.4	T.	T.
Dyer	85	1	46.3	0.18	T.
Elko [1]	85	14	45.2	T.	T.
Ely	78	17	47.8	0.12	T.
Eureka	83	13	48.9	0.66	T.
Fallon	88	22	52.3	T.	T.
Gardnerville	80	12	50.5	0.00	
Geyser	80	5	45.4	0.00	
Golconda	83	15	51.0	0.00	
Halleck [1]	82	3	43.8	T.	T.
Hamilton	78	12	45.8	1.03	T.
Hazen	90	20	54.4	T.	
Humboldt	78	20	52.0	0.00	
Leetville	87	22	52.8	0.00	
Lewers Ranch	82	21	52.4	0.00	
Logan	100	34	67.2	0.00	
Lovelocks	86	11	50.6	0.00	
Mill City [1]	82	26	51.1		
Mina	91	19	57.8	0.00	
Palisade	82	8	46.0	0.36	
Palmetto	80	11	48.0	0.10	T.
Ploche	90	19	54.2	T.	T.
Potts	76	5	42.4	0.15	
San Jacinto	82	7	46.0	0.10	
Soda Lake [2]	89	23	53.0	0.00	
Squaw Valley	84	3	43.8	T.	
Tecoma	82	11	45.5	0.20	T.
Wabuska	82	10	48.2	T.	
Wadsworth	85	21	52.8	0.00	
Wood	83	14	48.0	0.11	
New Hampshire.					
Alstead	70	26	47.4	3.18	T.
Bartlett				5.05	
Bethlehem	71	23	46.2	4.20	5.5
Bretton Woods				4.30	
Brookline	75	20	50.7	3.75	
Durham	71	24	50.5	2.33	
Franklin Falls	77	22	49.3	4.05	T.
Groveton				4.49	T.
Hanover	80	23	49.4	3.09	T.
Keene	79	20	49.5	3.63	T.
Nashua	74	23	50.4	2.24	
Newton	71	20	48.1	1.89	
North Woodstock				3.20	
Plymouth	72	19	47.8	4.03	
New Jersey.					
Asbury Park	70	34	56.1	5.01	T.
Bayonne	78	32	55.0	4.62	
Belvidere	77	27	54.3	6.59	
Bergen Point	77	35	55.4	4.76	T.
Beverly	76	30	54.3	3.95	T.
Bridgeton	80	29	57.2	3.80	
Browns Mills	75	26	56.0	4.90	
Canton				3.43	
Cape May C. H.	76	33	56.7	3.76	
Charlotteburg	73	19	52.2	4.58	T.
Clayton	77	31	56.0	4.26	
College Farm	75	27	54.0	3.02	
Dover	72	23	50.2	4.67	T.
Elizabeth	75	32	55.0	4.54	
Englewood	78	30	53.8	4.72	T.
Flemington	78	29	54.6	5.48	
Friesburg	77	28	54.8	4.56	
Hightstown	75	28	53.5	3.54	T.
Imlaystown	77	29	55.2	4.65	
Indian Mills	75	26	55.8	5.63	T.
Jersey City	77	35	56.0	4.16	T.
Lakewood	75[c]	30	54.9	4.81	
Lambertville	74	27	55.2	5.00	
Layton	76	11	51.8	3.32	
Moorestown	75	29	55.1	4.20	T.
Newark	76	30	55.0	4.23	
New Brunswick	75	25	53.7	3.08	T.
Newton	75	22	52.5	3.44	
Oceanic	80	34	56.8	4.90	
Paterson	77	31	55.8	4.61	T.
Phillipsburg	76	27	53.8	5.47	
Plainfield	75	28	54.0	4.72	T.
Pleasantville				6.97	
Rancocas				4.54	T.
Somerville	76	28	54.8	4.94	
South Orange	72	31	53.6	4.52	
Sussex	74	24	53.2	2.71	T.
Toms River	77	25	54.5	7.14	T.
Trenton	73	30	55.8	3.56	T.
Tuckerton	75	28	55.6	4.42	T.
Vineland	75	27	55.6	4.71	T.
Woodbine	76	27	56.4	3.50	
New Mexico.					
Alamagordo	89	29	60.0	0.43	T.
Albert	87	24	55.8	0.48	1.0
Alto				1.26	3.0
Aragon	80	17	52.3	T.	
Artesia	88	23	56.6	1.13	T.
Bellranch	88	21	55.6	1.19	1.0
Bloomfield	83	26	54.0	0.34	T.
Carlsbad	93	26	59.4	0.45	
Chama	71	5	45.4	1.73	16.0
Cimarron	85	5	47.1	1.17	12.0
Cliff	89	17	57.0	0.00	
Cloudcroft	64	15	42.8	1.29	3.0
Datil	84	4	49.8	0.00	
Deming	92	18	59.8	0.02	
Dorsey	80	5	49.5	0.80	5.0
Dulce	78	0	44.6	2.32	13.0
Eagle Rock Ranch	74	6	45.4	1.98	8.0
Elizabethtown	65	−4	39.8	2.03	15.0
Elk	81	23	53.0	0.77	0.5
El Vado	82[c]	6	44.8	1.76	9.5
Estancia	81	10	49.8	2.17	9.0
Fairview	84	19	53.0		
Fort Bayard	83	19	56.6	0.23	T.
Fort Stanton	76	21	50.6	1.45	0.7
Fort Union	75	5	45.4	3.10	
Fort Wingate	78	14	50.4	0.60	6.0
Fruitland	80	20	51.4	0.13	T.
Glen	89	19	56.8	0.49	T.
Hope				1.09	T.
Laguna	80	22	52.2	1.33	7.0
Lagunita	83	20	52.0	1.77	0.5
Lake Valley				0.65	0.5
Las Vegas	80	6	49.4	1.67	9.0
Lordsburg	88	23	60.0	0.00	
Los Alamos				1.51	10.0
Los Lunas	84	25	53.4	1.57	8.0
Luna	74	11	45.2	0.34	2.0
Magdalena	80	20	52.0	0.70	6.5
Manuelito				0.27	3.0
Mesilla Park	92	24	59.6	0.24	
Mimbres				0.02	
Mineral Hill				2.21	14.0
Monument	91	21	59.0	0.04	
Mountain Air	79	16	51.1	1.96	8.0
Nara Visa	87	23	54.9	0.61	0.5
Orange	88	17	56.0	0.28	
Palma				0.85	8.5
Portales				0.39	0.2
Red River	68	18	42.2	1.60	16.0
Redrock				0.29	
Rincon	89[c]	26[c]	60.4[c]	0.72	T.
Rociada	72	1	43.8	3.83	21.0
Rosedale	77	16	52.2	0.74	7.7
San Marcial	92	24	59.4	0.10	1.0
San Rafael	80	20	52.0	0.27	1.0
Socorro	88	22	56.7	1.30	9.0
Springer	80	0	47.2	0.75	5.5
Strauss				0.20	
Taos	80[b]	11[b]	48.2[b]	0.89	3.5
Tres Piedras				1.65	20.0
Tucumcari	87	24	56.8	0.62	0.8
Valley				0.36	3.5
Vermejo	72	−4	41.8	1.43	9.5
Whiteoaks				1.73	3.0
Winsor	71	3	42.0	2.58	12.0
New York.					
Adams	79	29	52.4	9.97	13.0
Addison	79	22	50.8	3.86	T.
Amsterdam	78	24	50.1	2.70	1.5
Angelica	71	22	48.0	4.66	4.0
Appleton	79	29	50.4	6.48	T.
Athens	76	26	53.2	4.60	T.
Atlanta	76	25	48.2	4.64	9.0
Atwater				3.80	2.6
Auburn	77	29	50.0	5.41	5.0
Avon	76	28	49.5	5.72	5.0
Baldwinsville	78	28	50.6	4.99	
Ballston Lake	75	23	49.6	3.13	2.0
Bedford	73	27	53.7	4.63	
Berlin	72	22	48.8	4.29	2.0
Blue Mountain Lake				4.08	7.0
Bolivar	75	22	48.6	4.68	8.0
Bouckville	75	18	44.9	5.41	5.0
Brockport	79	29	50.5	6.68	11.0
Cape Vincent	75	29	49.8	6.70	
Carmel	68	23	50.6	5.24	
Carvers Falls	78	26	49.2	2.20	
Chatham	68	25	50.8[c]	3.22	T.
Chazy	75	28	49.4	2.74	T.
Coeymans	78	23	52.4	6.20	T.
Cold Spring Harbor	79	30	55.3	7.95	
Cooperstown	68	25	47.7	3.63	2.0
Cortland	70	23	46.6	3.97	1.0
Cutchogue	76	34	56.2	6.52	
Dannemora	73	26	47.2	2.54	T.
Dekaib	78[c]	25[c]	46.6[c]	5.65	1.5
De Ruyter	77	26	48.6	4.35	3.9
Easton				3.38	4.0
Elba	76	28	49.1	5.59	9.0
Elmira	80	26	51.4	2.75	T.
Fayetteville	78	30	51.4	5.11	4.0
Fort Plain	73	27	51.4	2.64	T.
Franklinville	72	23	48.0	5.61	12.0
Gabriels	80	20	44.6[c]	1.72	2.0
Gansevoort				3.54	
Glens Falls	77	22	50.7	3.39	T.
Gloversville	73	22	48.1	3.06	T.
Greenfield	79	24	50.3	3.68	3.5
Greenwich	74	24	50.0	3.43	T.
Griffin Corners	73	17	47.1	3.50	1.0
Harkness	77	27	48.3	2.40	0.6
Haskinville				3.63	0.7
Hemlock	72	31	51.2	3.31	1.0
Hunt	74	25	48.4	5.15	6.0
Indian Lake	76	20	46.5	3.57	
Ithaca	77	30	50.0	3.30	3.6
Jamestown	81	27	50.4	6.07	8.0
Jeffersonville	77	20	48.8	3.45	T.
Keene Valley	79	21	47.6	3.73	T.
Lake George	72	27	50.0	2.98	T.
Le Roy	76	29	49.3	5.57	13.5
Liberty	73	27	48.1	3.48	T.
Littlefalls, City Res.	74	25	48.6	4.26	T.
Lockport	71	30	50.2	7.80	T.
Lowville	76	19	47.8	4.84	9.0
Lyndonville				6.11	T.
Lyons	82	30	51.4	4.21	1.0
Middletown	72	29	52.6	3.19	
Mohonk Lake	68[c]	32[c]	49.2[c]	3.75	T.
Moira	80	21	49.1	4.28	T.
Mount Hope	77	26	53.8	6.08	
Newark Valley				5.40	2.0
New Lisbon	73	20	47.1	3.33	2.0
North Hammond	75[c]	30[c]	47.6[c]	4.38	T.
North Lake	73	11	44.6	3.58	4.0
Norwich	73	25	50.7	4.45	T.
Ogdensburg	75	28	49.2	4.33	T.
Oneonta	82	25	51.8	3.09	T.
Oswegatchie	65	23	43.4	1.51	13.0
Otto	76	27	49.4	5.09	
Oxford	73	25	50.0	4.41	T.
Oyster Bay	74	32	53.4	5.73	T.
Palermo				4.46	2.0
Perry City	78	22	47.6	3.71	4.5
Plattsburg	72	28	51.1	2.18	T.
Port Jervis	77	22	52.2	2.58	T.
Potsdam	81	26	48.3	4.78	0.4
Richland	79[f]	29	52.4[c]	6.04	T.
Ridgeway	75	30	50.4	6.60	9.5
Romulus	78[d]	30[d]	49.9[d]	5.42	4.0
Saranac	77	23	46.4	3.48	0.3
Scarsdale	73	27	52.0	2.40	
Scottsville				5.88	
Setauket	74	35	54.8	9.20	
Shortsville	76	31	49.8	4.59	5.6
Skaneateles				5.42	
Southampton	73	31	54.8	6.57	T.
South Canisteo	75	23	48.8	5.88	5.5
Spier Falls	75	25	49.5	3.03	T.
Taberg	77	21	51.2	5.15	T.
Ticonderoga	80	27	50.7	2.94	T.
Volusia	75	27	49.4	7.59	11.5
Wappinger Falls	75	27	52.6	3.63	T.
Warwick				2.88	
Watertown	74	25	49.3	7.55	5.0
Waverly	78	21	50.4	3.44	0.5
Wedgwood	77	27	48.6	3.44	6.2
West Berne	82	20	49.8	2.80	T.
Westfield	76	28	50.2	8.64	3.7
Westpoint	71	31	51.5	4.10	T.
Windham	74	20	49.0	3.11	T.

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
New York—Cont'd.					
Youngstown	.....	.....	.....	7.19	7.5
North Carolina.					
Beaufort	85	41	67.2	5.89	
Brevard	80	22	55.0	6.09	
Brewers	.....	.....	.....	5.14	
Buck Springs	73	13	47.6	11.67	
Caroleen	81	27	58.6	2.80	
Chalybeate Springs	84	24	61.7	2.00	
Chapelhill	82	26	58.0	2.38	
Eagletown	87	28	61.3	3.38	
Edenton	83	28	62.0	6.40	
Fayetteville	85	28	61.6	3.06	
Goldsboro	83	31	60.4	3.99	
Greensboro	81	26	56.2	3.48	
Greenville	.....	.....	.....	4.40	
Henderson	80	30	57.9	2.87	
Hendersonville	76	23	54.4	4.26	
Horse Cove	75	25	54.2	8.80	
Hot Springs	81	27	57.8	2.48	T.
Kinston	87	28	64.4	4.13	
Lenoir	82	27	57.4	3.02	
Lexington	88	27	57.7	4.75	
Lincolnton	86	26	60.2	3.07	
Linville	69	15[c]	48.4	9.28	T.
Louisburg	81	28	59.2	3.40	
Lumberton	86	28	61.4	2.64	
Marion	80	25	55.3	.....	
Marshall	92	23	57.6	.....	
Moncure	83	26	59.6	2.18	
Monroe	83	23	57.6	6.02	
Morganton	77	24	56.2	5.99	
Mountairy	82	21	55.8	4.30	
Mount Holly	.....	.....	.....	4.56	
Nashville	84	25	60.2	2.94	
Newbern	87	31	63.8	4.65	
Patterson	74	24	53.6	6.49	
Pinehurst	84	30	62.0	3.31	
Pink Beds	74	16	49.1	8.01	
Pittsboro	80[b]	22[c]	61.2[b]	2.31	
Reidsville	84	27	56.8	3.59	
Rockingham	85	27	60.7	.....	
Salem	79	25	56.3	3.29	
Salisbury	84	24	57.1	3.33	
Saxon	75	23	55.6	6.03	
Scotland Neck	84	30	62.2	3.69	
Selma	83[c]	29[c]	59.6[c]	2.30	
Sloan	92	29	63.0	5.14	
Snowhill	85	28	62.6	3.70	
Southern Pines	85	27	60.4	6.32	
Southport	85	36	66.5	8.02	
Statesville	80	25	57.4	4.11	
Tarboro	87	27	62.4	2.87	
Vade Mecum	80	20	54.4	5.69	
Washington	89	28	65.4	5.26	T.
Wash Woods	.....	.....	.....	3.86[e]	
Waynesville	76	23	53.2	3.43	
Weldon	85	27	60.6	2.44	
North Dakota.					
Amenia	84	15	44.4	0.84	
Beach	88	15	46.6	0.44	
Berlin	86	10	44.9	1.67	11.0
Bottineau	83	17	44.8	0.96	
Buford	84	18	47.8	0.38	
Cando	82	10	42.2	0.25	T.
Cooperstown	85	10	44.2	0.25	T.
Denbigh	82	12	44.2	0.06	
Dickinson	85	11	46.4	0.14	T.
Donnybrook	82	14	45.2	0.39	T.
Dunseith	79	14	43.0	0.74	
Edgeley	83	14	45.4	0.93	6.5
Edmore	83	4	43.4	0.20	2.0
Ellendale	87	13	48.2	.....	.....
Fargo	81	15	43.8	0.75	.....
Forman	83	11	49.0	.....	
Fort Berthold	86	17[j]	47.2[c]	0.44	
Fort Yates	87[d]	14[d]	50.2[c]	0.27	
Fullerton	82	10	44.4	1.63	9.5
Gladys	83	11	46.9	0.52	
Grafton	83	0	42.0	0.55	5.0
Hannah	82	5	40.8	0.25	
Hillsboro	84	17	44.6	0.98	
Jamestown	86	14	46.7	0.42	
Kulm	85	14	47.0	0.73	4.4
Lakota	83	6	41.2	0.09	T.
Lamour	.....	.....	.....	1.06	
Larimore	85	8	49.2	0.59	1.5
Lisbon	86	12	43.4	1.25	4.0
McKinney	84	9	43.9	0.11	
Manfred	85	8	42.8	0.20	T.
Medina	84	11	46.0	0.18	
Melville	85	13	46.2	.....	
Minot	89	13	46.1	1.06	
Minto	82[d]	4[c]	43.6[d]	0.15	1.0
Moyersville	85	9	44.4	0.30	T.
Napoleon	89	4	44.2	0.38	T.
Oakdale	86	21	48.2	0.22	T.
Oriska	86	18	44.9	0.86	
Park River	84	9	43.3	0.26	2.4

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
North Dakota—Cont'd.					
Pembina	78	0	40.2	0.54	4.0
Portal	81	15	44.0	0.13	
Power	84	10	44.2	1.38	4.5
Pratt	85	7	44.8	0.73	
Sentinel Butte	85[c]	17[c]	48.0[c]	0.20	
Steele	87	12	46.2	0.20	T.
University	84	5	44.2	0.98	4.0
Valley City	86	16	45.3	1.50	.....
Willow City	80	11	44.2	0.55	
Wishek	84[d]	8[d]	44.1[d]	0.63	2.0
Ohio.					
Akron	74	27	51.4	3.27	1.4
Amesville	79	20	54.8	4.38	1.0
Atwater	72	24	50.0	4.01	1.7
Bangorville	75	22	51.2	4.16	1.5
Beaver Dam	.....	.....	.....	2.95	
Bellefontaine	80	23	52.4	2.49	1.1
Benton Ridge	75	24	52.4	4.06	1.5
Bladensburg	76	19	51.1	3.38	0.5
Bowling Green	76	23	51.7	3.79	
Bucyrus	78	22	50.7	3.77	1.5
Cadiz	77	23	52.9	2.95	T.
Cambridge	82	20	53.3	2.62	T.
Camp Dennison	81	24	54.9	1.47	0.1
Canal Dover	74	25	51.6	3.27	T.
Canton	74	24	50.9	3.20	1.4
Cardington	78	21	51.5	3.41	1.0
Circleville	77	24	52.6	2.58	T.
Clarington	84	25	55.4	3.37	T.
Clarksville	77	27	55.3	1.72	T.
Cleveland[b]	75	30	51.5	5.08	6.0
Dayton	80	26	53.8	1.51	T.
Defiance	89	23	54.2	2.83	0.2
Delaware	77	20	52.1	1.97	0.5
Demos	80	25	54.1	2.86	1.5
Findlay	91	24	54.5	2.94	0.5
Frankfort	78	26	54.4	2.22	
Fremont	79	25	52.6	4.20	T.
Garrettsville	75	18	50.1	5.94	5.0
Granville	76	21	52.8	3.07	0.7
Gratiot	74	19	51.4	3.36	1.4
Green	80	27	55.8	2.72	0.5
Greenhill	76	19	50.6	3.17	1.5
Greenville	78	23	52.5	2.28	T.
Hedges	77	21	51.8	4.03	0.5
Hillhouse	78	28	50.9	8.97	9.0
Hiram	77	24	50.4	5.62	10.0
Hudson	78	21	49.8	5.06	4.5
Ironton	82	25	58.0	1.89	T.
Jacksonburg	82	22	54.2	1.77	1.0
Kenton	80	23	50.8	3.04	1.0
Killbuck	75	20	53.3	3.41	1.0
Lancaster	76	24	53.0	2.42	0.5
Lima	76	21	53.2	2.65	T.
McConnelsville	79	22	53.3	3.56	2.0
Manara	73	20	52.3	2.05	T.
Marietta	76	27	55.5	3.41	T.
Marion	83	24	52.6	3.22	0.3
Medina	76	23	50.6	4.06	4.0
Milfordton	79	18	50.4	3.04	2.0
Milligan	80	18	53.8	4.48	2.0
Millport	75	19	50.8	2.70	0.3
Napoleon	80	23	53.4	2.19	T.
Nellie	76	21	52.4	3.11	T.
New Alexandria	80	21	53.2	3.05	T.
New Berlin	77	22	50.9	4.00	1.5
New Bremen	78	24	54.3	1.78	0.5
New Richmond	79	26	55.9	0.95	T.
New Waterford	76	22	50.8	3.06	1.5
North Lewisburg	78	20	51.2	2.85	
North Royal	74	21	51.0	5.04	6.0
Norwalk	77	24	52.2	3.91	1.
Oberlin	77	23	51.4	4.25	3.0
Ohio State University	75	23	52.8	2.01	T.
Orangeville	76	27	50.6	3.27	6.0
Ottawa	80	24	52.8	.....	T.
Pataskala	75	22	52.6	3.48	1.8
Philo	78	24	53.8	2.69	0.7
Plattsburg	78	26	53.4	1.89	T.
Pomeroy	77	28	55.0	1.45	0.2
Portsmouth	77	27	54.8	1.66	T.
Pulse	78	25	54.8	1.07	0.2
Rittman	79	20	50.8	3.82	0.2
Rockyridge	77	24	52.4	4.09	T.
Shenandoah	75	22	50.6	5.44	0.4
Sidney	81	25	53.6	1.88	0.8
Somerset	75	27	53.8	3.42	5.0
South Lorain	79	26	52.0	3.61	1.5
Springfield	.....	.....	.....	1.63	T.
Summerfield	79	21	53.5	4.24	0.5
Thurman	79	22	56.3	1.79	T.
Tiffin	74	26	52.0	3.87	T.
Toledo (St. Johns College)	76	24	51.2	3.14	0.5
Upper Sandusky	76	24	52.6	2.98	T.
Urbana	77	22	52.2	1.89	1.2
Vickery	78	25	51.6	4.45	T.
Warren	78	20	51.0	4.75	7.7
Wauseon	78	21	50.0	2.35	0.5

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Ohio—Cont'd.					
Waverly	82	22	55.4	1.90	0.2
Waynesville	77	25	54.2	1.43	T.
Wellington	76	24	51.4	2.91	T.
Willoughby	.....	.....	.....	5.11	4.0
Wilson	81	21	54.6	1.74	T.
Wooster	74	22	51.4	3.55	1.0
Zanesville	.....	.....	.....	2.82	
Oklahoma.					
Alva	86	25	56.0	4.24	
Arapaho	87	24	56.6	3.23	
Beaver	90	24	52.3	4.06	
Chandler	90	27	60.4	1.83	
Chattanooga	87	30	58.8	2.25	
Cloud Chief	86	26	55.8	2.32	
Dacoma	87	23	57.0	2.90	
Enid	92	29	58.4	3.25	
Erick	88	26	60.7	4.11	
Fort Reno	85	27	54.6	2.80	
Fort Sill	86	28	57.8	2.00	
Frederick	.....	.....	.....	2.55	
Gage	85	21	56.8	3.12	
Grande	86	23	54.8	2.87	
Guthrie	88	23	59.1	1.71	
Harrington	84	25	54.4	4.74	
Helena	85[f]	24[f]	55.0[f]	1.30	
Hennessey	87	26	58.1	2.39	
Hobart	85	27	57.8	2.82	
Hooker	90	20	53.3	3.66	
Jefferson	80	28	56.1	2.50	
Kenton	86	21	53.6	1.11	
Kingfisher	88	24	58.1	2.54	
McComb	85	30	59.5	2.01	
Mangum	87	35	57.1	3.25	
Meeker	85	23	58.2	1.75	
Neola	85	25	57.3	1.80	
Newkirk	86	28	58.6	0.78	
Okeene	88	22	57.2	2.03	
Pawhuska	97	26	59.7	1.49	
Perry	89	24	58.0	1.68	
Sac and Fox Agency	86	29	59.4	1.52	
Shawnee	86	29	58.1	1.82	
Snyder	86	27	57.7	2.61	
Stillwater	84	26	55.8	1.24	
Taloga	85	24	54.6	1.97	
Temple	90	30	59.3	2.87	
Waukomis	90	26	59.4	3.12	
Weatherford	91	21	55.3	2.40	
Whiteagle	87	26	58.2	0.79	
Oregon.					
Albany	80	30	53.6	2.31	
Alpha	84	29[j]	54.4[c]	5.71	
Ashland	88	29	55.1	0.79	
Astoria	75	39	56.9	8.67	
Aurora (near)	82	30	53.7	3.28	
Bay City	81	32	54.1	11.28	
Bend	85	14	49.4	0.26	
Beulah	78	10	44.6	0.10	
Blackbutte	78	32	52.0	3.15	
Blalock	85	33	59.6	0.05	
Buckhorn	87	25	53.6	1.19	
Bullrun	82	32	52.5	9.51	
Burns	84	16	51.6	0.23	
Carlton	82	28	51.8	4.36	
Cascade Locks	81	31	54.6	7.93	
Coquille	.....	.....	.....	2.89	
Corvallis	82	29	53.8	2.70	
Dale	.....	.....	.....	0.77	T.
Dayville	90	20	53.2	0.25	
Doraville	83	32	52.2	5.38	
Drain	86	35	56.2	2.78	
Echo	86[c]	25[c]	55.4[c]	0.30	
Ella	85	23	55.4	0.10	
Eugene	81	29	55.0	3.53	
Fairview	91	30	54.6	3.74	
Falls City	71	31	50.9	5.44	
Forestgrove	82	25	50.9	3.95	
Gardiner	85	36	56.4	4.74	
Glendale	88	28	54.8	0.98	
Glenora	89	29	51.2	16.07	
Gold Beach	86	33	54.0	2.89	
Government Camp	77	21	45.9	10.01	14.0
Granite	78	16	45.8	0.60	1.0
Grants Pass	89	24	54.2	0.66	
Grass Valley	80	15	45.0	T.	
Heisler	85	15	51.9	0.10	
Heppner	81	26	54.1	0.54	
Hood River	83	28	55.3	2.87	
Hermiston	.....	.....	.....	0.08	
Huntington	80	30	54.6	3.04	
Jacksonville	86	26	54.9	0.64	
Joseph	81	22	48.0	0.88	0.2
Lagrande	85	25	52.2	1.32	
Lakeview	83	19	48.6	0.47	
Lost River	83	17	48.6	0.25	
McKenzie Bridge	92	24	52.9	6.83	
Marshfield	82	34	55.8	2.68	
Mill City	85	26	52.0	2.55	
Monroe	84[d]	32[d]	47.3[d]	.....	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Oregon—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mount Angel	85	32	56.8	5.23	
Nehalem	.....	.....	.....	14.35	
Newport	81	36	53.8	4.89	
Odell	.....	.....	.....	0.74	
Olex	82	25	54.0	0.36	
Paisley	80[c]	23[c]	48.5[d]	0.89	T.
Pendleton	81	23	53.2	0.66	
Port Oxford	78	40	55.2	3.89	
Prineville	83	15	48.3	0.51	T.
Prospect	80	20	44.0	2.35	
Riverside	82[p]	12[p]	42.9[p]	0.15	
Salem	80	33	55.1	2.38	
Sisters	84	14	49.0	0.17	
Sparta	80	20	47.0	0.06	
Stafford	83	31	54.4	5.95	
The Dalles	81	27	55.0	0.25	
Toledo	87	30	54.2	6.87	
Umatilla	88	26	56.2	0.29	
Vale	83[d]	18[d]	50.5[d]	0.09	
Van	.....	.....	.....	0.01	
Wallowa	83	20	48.8	1.50	0.5
Wamic	83	23	56.4	0.27	
Warm Spring	84	17	51.8	T.	
Weston	81	26[c]	51.9	1.47	
Williams	.....	21[b]	52.8[b]	.....	
Pennsylvania.					
Aleppo	80	17	52.8	2.23	1.0
Altoona	75	22	49.6	2.26	T.
Baldwin	75	24	51.1	5.51	3.0
Brower	.....	.....	.....	6.00	
California	80	24	55.6	3.30	0.5
Cassandra	70	22	48.7	2.22	2.0
Centerhall	72	24	48.4	3.98	0.8
Clarion	.....	.....	.....	3.70	
Claysville	80	19	53.2	3.36	3.0
Coatsville	79	27	54.0	6.37	
Confluence	.....	.....	.....	2.28	
Davis Island Dam	.....	.....	.....	2.73	
Derry	87	28	54.8	2.88	1.0
Doylestown	.....	.....	.....	8.39	
Dushore	73	21	47.2	3.85	6.5
East Mauch Chunk	78	24	52.8	6.19	
Easton	74	28	54.1	5.17	
Ellwood Junction	.....	.....	.....	3.76	
Emporium	76	26	50.6	3.04	T.
Ephrata	78	27	54.0	6.01	
Everett	77	22	50.3	3.75	T.
Forks of Neshaminy	.....	.....	.....	4.48	
Franklin	78	21	50.4	.....	T.
Freeport	80	24	53.0	3.80	T.
Gettysburg	76	25	53.1	5.36	
Girardville	.....	.....	.....	5.96	3.0
Gordon	76	22	51.3	5.98	
Greensboro	.....	.....	.....	3.38	
Greenville	77	22	51.0	5.20	9.0
Hamburg	77	27	53.8	6.42	
Hanover	80	28	56.6	6.92	T.
Herrs Island Dam	.....	.....	.....	3.35	
Huntingdon	78	23	52.3	3.22	T.
Hyndman	79	21	53.0	1.97	T.
Indiana	78	24	51.7	3.08	0.5
Irwin	84	22	55.8	3.10	T.
Johnstown	78	26	53.2	2.50	T.
Kennett	74	30	53.8	4.04	
Lansdale	.....	.....	.....	6.24	
Lawrenceville	79	20	49.6	3.67	1.0
Lebanon	79	28	53.8	5.75	T.
Leroy	73	26	49.1	4.63	4.5
Lewisburg	78	25	52.5	4.58	
Lockhaven	77	26	52.6	4.17	T.
Lock No. 4	.....	.....	.....	3.84	
Lycippus	77	27	52.8	2.62	1.1
Marion	75	26	52.4	4.75	
Mifflintown	76	24	52.1	5.72	T.
Milford	75	21	51.2	4.60	T.
Montrose	74	22	49.2	3.85	4.0
New Germantown	78	25	52.5	7.54	
Ottsville	.....	.....	.....	4.93	
Parker	.....	.....	.....	3.64	
Philadelphia	73	35	56.0	5.16	T.
Pocono Lake	71	17	46.7	7.47	
Point Pleasant	.....	.....	.....	5.36	
Reading	77	28	55.4	5.92	
Renovo	.....	.....	.....	4.08	
Saegerstown	77	14	50.2	6.71	7.0
St. Marys	72	25	48.2	3.89	4.5
Saltsburg	.....	.....	.....	2.81	
Seisholtzville	.....	.....	.....	5.89	
Selinsgrove	77	27	53.0	5.25	T.
Shawmont	.....	.....	.....	5.12	
Skidmore	78	21	51.4	3.24	2.0
Smiths Corners	.....	.....	.....	5.66	
Somerset	72	20	49.7	2.47	2.4
South Eaton	73	28	51.4	4.28	T.
Springdale	.....	.....	.....	4.01	
Springmount	.....	.....	.....	5.59	
State College	72	26	49.6	3.31	T.
Towanda	75	24	50.6	3.55	1.0
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Uniontown	80	25	54.0	2.87	1.5
Warren	82	26	50.8	5.08	10.0
Wellsboro	74	21	48.5	4.06	0.9
Westchester	76	32	54.4	5.85	
West Newton	.....	.....	.....	3.22	
Whitehaven	74	22	50.2	5.01	T.
Wilkesbarre	73	30	53.2	3.84	T.
Williamsport	75	28	52.4	4.87	T.
Rhode Island.					
Bristol	71	35	54.1	4.12	
Kingston	77	29	51.8	5.68	
Pawtucket	.....	.....	.....	4.66	
Providence	76	34	54.2	5.39	
South Carolina.					
Aiken	79	33	61.2	1.35	
Allendale	84	37	63.2	1.25	
Anderson	88	30	60.4	2.41	
Batesburg	85	30	60.7	2.79	
Beaufort	84	40	65.8	5.84	
Bennettsville	83	30	61.9	0.84	
Blackville	87	33	62.4	2.04	
Blairs	.....	.....	.....	2.08	
Bowman	84	33	63.0	3.85	
Calhoun Falls	.....	.....	.....	3.06	
Camden	81	30	61.6	5.58	
Catawba	.....	.....	.....	4.30	
Chappells	.....	.....	.....	1.68	
Cheraw	84	30	60.5	2.70	
Clarks Hill	82	30	60.2	2.21	
Clemson College	79	29	60.4	4.11	
Conway	88	34	64.4	8.14	
Darlington	87	29	62.0	3.37	
Dillon	86[c]	29[c]	63.2[c]	3.33	
Due West	80	32	61.2	2.90	
Edisto	.....	.....	.....	2.65	
Effingham	.....	.....	.....	3.00	
Florence	85	33	61.8	2.18	
Georgetown	84	37	64.8	12.15	
Greenville	78	26	56.6	3.43	
Greenwood	77	30	59.0	2.62	
Heath Springs	84	24	58.6	3.87	
Kingstree	89	37	65.0	5.28	
Liberty	78	28	58.8	3.40	
Little Mountain	81	33	60.6	1.62	
Newberry	83	30	60.6	2.41	
Pelzer	.....	.....	.....	3.33	
St. Georges	84	37	64.0	6.32	
St. Matthews	82	30	61.4	3.13	
St. Stephens	.....	.....	.....	4.81	
Saluda	84	31	60.6	2.28	
Santuck	80	29	59.4	2.68	
Smiths Mills	.....	.....	.....	5.95	
Society Hill	82	53	60.5	3.70	
Spartanburg	83	28	59.2	3.07	
Stateburg	83	36	62.8	6.33	
Summerville	87	35	64.3	6.24	
Sumter	90	30	64.0	5.73	
Trenton	80	35	59.6	1.64	
Trial	86	34	63.5	4.22	
Walhalla	84	29	61.2	5.44	
Walterboro	85	36	64.5	4.16	
Winnsboro	82	32	60.6	3.35	
Winthrop College	82	30	59.4	4.33	
Yemassee	84	36	62.5	5.19	
Yorkville	83	32	60.3	3.14	
South Dakota.					
Aberdeen	84	11	46.0	2.75	16.0
Academy	88	21	50.8	3.06	4.2
Alexandria	84	15	47.2	3.43	T.
Armour	89	14	48.9	2.50	2.0
Ashcroft	91	11	46.0	0.30	
Bowdle	88	12	47.0	1.60	16.0
Brookings	79	13	46.6	3.01	T.
Canton	79	17	48.8	3.18	2.0
Castlewood	79	13	45.4	2.44	T.
Centerville	78	19	49.2	3.87	4.0
Chamberlain	93	16	51.5	3.08	0.8
Cherry Creek	101	15	52.5	1.40	
Clark	78	16	46.2	3.08	0.2
Clear Lake	76	20	46.4	2.93	
Desmet	82	18	47.5	3.36	T.
Doland	86	10	47.1	2.97	T.
Elkpoint	83	19	50.6	4.00	T.
Fairfax	78	16	48.8	2.68	4.0
Farmingdale	.....	.....	.....	1.37	3.0
Faulkton	85	11	46.0	1.84	6.5
Flandreau	80	17	47.6	3.42	2.5
Forestburg	84	10	47.2	2.09	
Fort Meade	86	18	49.9	1.20	10.0
Greenwood	87	20	51.2	4.03	3.0
Hermosa	86[1]	21	50.8[4]	1.17	5.5
Highmore	88	15	48.8	2.41	3.0
Howard	78	15	46.2	3.21	T.
Howell	86	11	47.0	2.33	1.2
Ipswich	85	13	45.7	1.14	8.0
Kennebec	95	14	48.3	2.91	2.0
Kidder	84	12	44.4	1.96	12.0
Kimball	86	20	48.2	3.17	3.0
South Dakota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Leola	85	14	46.0	2.05	18.0
Little Eagle	90	11	48.2	0.25	2.5
Marion	92	18	54.0	3.52	
Mellette	85	10	47.0	1.58	1.0
Menno	84	19	49.0	3.12	T.
Mil'bank	84	20	46.2	3.61	T.
Mitchell	87	15	49.3	2.55	3.0
Oelrichs	85[g]	18[g]	42.0[g]	0.80	6.0
Orman	85	14	47.9	0.98	3.0
Pine Ridge	89	17[b]	48.0[d]	1.53	11.8
Plankinton	83	16	48.1	2.75	6.5
Ramsey	80	10	46.6	4.28	3.0
Redfield	84	12	45.6	2.14	T.
Roslyn	80[b]	14	47.2[d]	1.36	3.0
Rousseau	.....	.....	.....	1.01	
Sioux Falls	79	18	48.6	3.81	2.0
Spearfish	85	11	49.8	2.27	11.5
Stephan	88	9	48.0	2.56	1.0
Tyndall	86	19	52.0	3.89	T.
Vermillion	79	21	50.6	2.52	T.
Watertown	75	15	43.9	3.07	
Wentworth	78	17	47.1	3.30	1.5
Whitehorse	86	13	48.6	0.31	2.1
Woolsey	.....	.....	.....	3.26	1.0
Tennessee.					
Andersonville	.....	.....	.....	3.15	T.
Arlington	82	31	57.4	1.77	
Ashwood	86	25	58.8	4.60	
Benton	84	25	58.6	3.97	
Bluff City	.....	.....	.....	2.64	
Bolivar	82	29	56.2	3.48	
Bristol	76	25	55.0	2.65	T.
Brownsville	81	34	58.1	3.55	
Byrdstown	82	25	57.4	4.65	T.
Carthage	86	27	59.2	2.26	
Cedar Hill	88	24	58.6	2.00	
Celina	.....	.....	.....	4.05	
Charleston	.....	.....	.....	6.54	
Clarksville	82	30	60.0	1.50	
Clinton	.....	.....	.....	4.10	
Covington	80	32	58.2	4.75	
Decatur	84	24	58.3	4.01	
Dover	90	26	58.8	2.27	
Dyersburg	83	33	58.2	1.76	
Elizabethton	79	25	54.6	1.46	T.
Erasmus	85	20	54.0	5.50	T.
Florence	82	27	58.4	4.18	
Franklin	81	27	56.4	3.89	
Greeneville	78	24	56.2	2.86	T.
Harriman	82	27	57.0	2.89	
Hohenwald	84	19	55.4	4.30	
Iron City	85	24	57.4	3.47	
Jackson	87	30	60.4	2.84	
Johnsonville	84	27	58.2	3.25	
Jonesboro	82	22	54.9	1.77	T.
Kenton	86	29	59.3	1.78	
Kingston	.....	.....	.....	3.39	
Lafayette	87	25	57.4	2.47	
Leadvale	.....	.....	.....	2.10	
Lewisburg	88	25	58.4	3.39	
Loudon	.....	.....	.....	3.20	
Lynnville	81	27	57.8	3.37	
McGee	.....	.....	.....	3.81	
McMinnville	86	24	58.6	3.32	
Maryville	84	25	58.0	2.98	
Milan	81	30	56.6	5.77	
Monterey	83	22	56.2	4.55	T.
Newport	80	30	57.6	1.71	
Palmetto	87	26	59.4	3.56	
Pinewood	86	23	57.6	2.79	
Pope	83	25	57.6	4.45	
Rogersville	84	26	57.4	3.17	T.
Rugby	86	20	54.6	2.67	T.
Savannah	81	28[g]	55.9[d]	4.42	
Sevierville	82	24	57.5	1.99	
Sewanee	80	25	56.3	4.13	
Silver Lake	72	19	51.7	4.08	1.0
Sparta	84	24	58.5	2.79	
Springdale	88	22	57.0	1.75	T.
Springville	86	25	58.0	3.14	
Tazewell	.....	.....	.....	2.27	
Tellico Plains	86	25	59.2	2.57	
Tracy City	85	24	54.5	4.41	
Trenton	84	27	57.8	1.90	
Tullahoma	83	23	58.0	4.46	
Union City	85	29	58.4	1.12	
Watertown	89	26	60.0	3.65	
Waynesboro	83	25	57.4	4.27	T.
Wildersville	79	30	58.0	3.30	
Yukon	81	29	58.4	3.44	
Texas.					
Albany	91	30	60.6	1.47	
Alvin	.....	.....	.....	11.70	
Arthur	.....	.....	.....	3.20	
Austin	86	48	66.4	0.69	
Ballinger	93	29	60.8	0.95	
Barstow	95	28	60.9	0.24	
Beaumont	.....	.....	.....	8.76	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Beeville	94	42	67.8	3.80	
Big Spring	94	31	59.4	1.11	
Blanco	85	33	61.1	0.75	
Boerne	90	33	63.6	1.00	
Booth				8.49	
Bowie	88	30	61.5	1.32	
Brazoria				7.33	
Brenham	88	44	65.2	1.28	
Brighton	90	51	72.2	5.42	
Brownwood	89	33	60.7	0.53	
Channing	89	29	55.1	1.20	
Childress	89	31	57.5	2.50	
Chillicothe				4.58	
Clarksville	85	31	61.0	3.05	
Claude	83	23	52.4	3.20	
Claytonville				1.34	
Coleman	84	34	61.9	1.30	
College	88	45	67.6	4.65	
Colorado	93	26	60.4	2.77	
Columbus				3.00	
Corsicana	35	39	62.5	1.76	
Crockett	86	39	64.8	3.42	
Cuero	89	42	67.2	2.80	
Dallas	87	35	61.7	1.16	
Danevang	92	43	67.6	2.85	
Denison				T.	
Dialville	80	41	62.0	3.31	
Duval	88	42	65.8	0.92	
Eagle Pass	85	40	63.4	1.60	
Fort Clark	87	42	67.0	0.85	
Fort Davis	88	22	56.2	0.81	
Fort McIntosh	94	44	70.0	0.86	
Fredericksburg	85	33	61.4	0.78	
Gainesville	84	30	60.6	1.56	
Gatesville	84	34	62.4	1.40	
Georgetown	89	37	64.6	0.71	
Gonzales				1.68	
Graham	91	29	60.6	1.47	
Grapevine				1.06	
Greenville	85	37	62.0	2.78	
Hale Center	83	21	51.1	1.13	
Hallettsville	99	40	68.2	2.49	
Haskell	93	30	56.8	5.78	
Hempstead				1.69	
Henrietta	90	31	59.3	1.47	
Hewitt				0.75	
Hillsboro	87	35	63.1	1.17	
Hondo	87	40	66.8	1.54	
Houston	90	45	66.3	6.31	
Hubbard	85	34	62.6	1.60	
Huntsville	85	38	63.2	2.26	
Jefferson	81	34	60.4	2.95	
Junction				0.95	
Kaufman	84	38	62.5	2.38	
Kent	90	25	64.8	0.80	
Kerrville	88	32	61.7	2.09	
Knickerbocker	90	28	60.7	0.71	
Kopperl				0.96	
Lampasas	90	33	60.8	1.11	
Lapara				3.31	
Liberty	88	40	66.3	10.65	
Llano	90	36	62.4	0.80	
Longlake				3.86	
Longview	81	39	61.2	4.23	
Lufkin	89	37	63.6		
Luling	88	41	66.3	1.16	
Marlin	90	38	63.8	2.22	
Mexia	85	39	61.2	1.53	
Miami	86	26	55.0	4.19	T.
Mount Blanco	88	24	55.8	0.75	
Nacogdoches	82	34	60.6	4.12	
Nazareth	86	19	54.3	1.22	
New Braunfels	88	40	66.8	1.30	
Panter				1.19	
Paris	85	35	62.6	0.65	
Pierce	90	40	66.6	1.55	
Plemos	89	22	54.5	2.21	
Port Lavaca	90	47	69.6	4.05	
Quanah				4.30	
Rhineland	92	29	57.8	2.65	
Riverside				2.25	
Rockisland	90	40	66.6	2.58	
Rockland				6.05	
Rockport	82	54	70.5	3.40	
Sabinal	91	32	65.6	1.59	
San Marcos	87	37	63.1	0.37	
San Saba	87	29	61.2	1.04	
Santa Gertrude				4.55	
Seymour	89	29	58.9	4.51	
Sherman	82	36	62.7	3.17	
Sonora	85	27	60.2	0.63	
Sulphur Springs	88	36	61.6	4.41	
Temple	88	34	61.0	1.14	
Texline	85	20	54.4	0.04	T.
Trinity	90	35	64.2	3.45	
Victoria	89	43	67.6	2.63	
Waco	87	40	64.4	1.66	
Waxahachie	91	35	61.2	1.64	
Weatherford	85	35	61.3	1.07	
Willspoint				4.02	
Utah.					
Alpine				2.00	T.
Alta	72	8	38.8	0.30	3.1
Aneth	86	22	54.5	0.11	
Blackrock	90	10	50.1	0.03	0.2
Blacksmith Fork				0.30	3.0
Castledale	79	19	45.5	0.40	
Castle Rock				0.14	3.0
Cedar City	85	19	51.6	0.10	1.0
Corinne	95	19	50.8	0.35	
Coyoto	85	9	46.1	T.	T
Deseret	87	10	47.2	T.	T.
Emery	80	18	49.0	0.60	6.0
Enterprise				T.	T.
Escalante	80	18	49.5	0.14	
Farmington	81	22	49.8	0.30	0.1
Fillmore	88	21	54.2	0.15	
Fort Duchesne	80	19	47.0	0.58	4.0
Garrison	82	10	48.0	0.10	1.0
Government Creek	82	29	49.0	0.25	2.5
Grantsville				0.65	6.5
Grayson	79	22	52.0	0.20	2.0
Heber	81	10	44.8	0.43	2.0
Henefer	85	7	44.6	0.16	0.5
Hite	91	29	59.8	0.11	T.
Huntsville				0.51	0.5
Ibapah	78	13	42.3	2.49	24.6
Indianola				T.	T.
Kanab	81°	9°	49.6°	0.20	2.0
Kelton				0.19	T.
La Sal	73	13	46.0	0.48	5.0
Levan	80	15	47.2	0.38	T.
Loa	72	13	40.7	0.00	
Logan				0.60	
Manti	80[1]	14[c]	46.2[3]	T.	T.
Marion				0.09	0.5
Marysvale	84	12	47.4	0.06	0.5
Meadowville	75	10	43.2	1.05	10.5
Millville				0.42	
Moab	86	23	52.8	0.23	1.0
Morgan	80	10	43.0	0.20	1.0
Mount Nebo	81	18	52.9	0.05	0.5
Mount Pleasant	79	15	47.6	0.40	
Nephi				T.	T.
Oak City	86	12	50.7	0.27	
Ogden	80	25	50.2	T.	
Parowan	79	18	48.4	0.41	3.6
Payson				0.13	1.0
Pinto				0.10	1.0
Plateau	77	6	44.7	0.41	4.6
Provo	91	19[c]	50.6	0.20	1.0
Ranch	78	10	46.5	T.	T.
Randolph				0.49	9.0
Rockville	94	26	60.6	0.00	
St. George	35	28	57.3	0.00	
Salt Air	78	21	49.4	0.37	3.0
San Juan				0.70	
Scipio	82	12	46.6	0.17	2.0
Snowville	83	9	46.1	0.46	
Soldier Summit	77	8	43.3	0.00	
Strawberry Valley	78	6	42.9	0.00	
Sunnyside				0.47	4.0
Theodore	79	11	46.1	1.40	15.0
Thistle	98	22	60.4	0.05	0.5
Tooele	79	21	52.2	0.54	
Tropic	83	21	52.8	T.	T.
Trout Creek	86	15	50.5	1.20	12.0
Utah Lake	79	12	48.0	0.38	1.0
Vernal	77	20	46.0	0.39	5.5
Vermont.					
Bloomfield	73	21	46.3	3.87	T.
Cavendish	78	21	47.1	2.39	T.
Chelsea	70	22	44.8	2.81	9.0
Enosburg Falls	79	23	48.4	2.91	0.5
Jacksonville	72	15	47.8	2.84	2.0
Manchester	71	22	48.2	4.29	7.5
Norwich	75	20	47.4	3.56	T.
St. Johnsbury	76	25	48.4	3.13	T.
Wells	70	22	48.0	3.80	2.0
Westfield	80	30		3.02	1.0
Woodstock	68	20	45.0	3.35	2.0
Virginia.					
Arvonia	83	22	56.6	9.63	
Ashland	78	29	56.6	9.40	
Barboursville	73	28	56.4	10.78	
Bigstone Gap	80	25	55.7	2.80	T.
Blacksburg	75	17	50.8	4.23	T.
Buchanan				8.53	
Burkes Garden	71	13	48.6	5.27	T.
Callaville	85	27	59.3	4.95	
Charlottesville	80	31	55.4	9.26	
Clarksville				4.02	
Columbia	78	26	56.0	7.22	
Dale Enterprise	81	18	53.4	4.53	T.
Danville				2.55	
Dinwiddie	82	22	58.2	4.65	
Doswell	84	20	57.8	9.35	
Elk Knob	77	23	55.2	2.48	
Farmville	80	25	56.4	7.98	
Fredericksburg	79	26	56.4	6.99	
Hampton	85	33	62.0	5.67	
Hot Springs	73	16	50.6	5.86	0.2
Lexington	78	21	52.8	6.12	T.
Lincoln	84	23	54.5	7.73	
Marion	78	20	53.8	4.21	T.
Milford	77	20	53.8	4.30	
Newport News	82	35	61.3	7.30	
Nokesville (near)	77	27	54.9	5.93	
Petersburg	82	22	56.4	3.68	
Quantico	77	25	56.2	5.49	
Radford				4.42	
Riverton				9.40	
Roanoke	80[d]	24[d]	56.7[d]		
Rockymount	78	28	55.3	9.54	
Shenandoah				5.42	T.
Skyland				15.21	0.5
Speers Ferry				2.98	
Spottsville	83	26	59.2	6.37	T.
Staunton	78	24	54.2	6.85	
Stephens City	84	24	53.6	7.35	
Williamsburg	79	27	59.6	5.54	
Woodstock	84	23	54.3	5.16	
Washington.					
Aberdeen	78	32	53.3	11.01	
Anacortes	77[f]	23[f]	51.0[f]	4.28	
Ashford				7.83	
Baker	81	10	47.4	9.76	
Bellingham	73	30	52.1	4.85	
Blaine	68	15	50.9	7.21	
Bogachiel	80	30	53.3	22.30	
Brinnon	79	31	52.0	6.24	
Cedar River				6.16	
Cedonia	78	23	49.9	0.55	
Centralia	86	29	32.8	5.40	
Cheney	80	19	50.4	0.83	
Clearbrook	79	25	50.8	8.08	
Cle Elum	81	19	47.6	1.67	
Colfax	85	20	50.8	0.98	
Colville	83	18	47.6	0.78	
Conconully	81	23	48.0	0.60	
Coupeville	71	33	52.6	2.12	
Crescent	79	20	49.8	0.68	
Easton				6.70	T.
East Sound	66°	27°	49.1		
Ellensburg	79	15	48.5	0.20	
Ephrata	85	25	55.0	0.18	
Fort Simcoe	83°	32°	57.2°	0.22	
Goldendale	75	21	50.4	0.40	
Granite Falls				8.64	
Hatton	85	20	52.7	0.43	
Ilwaco	86	36	54.8	10.97	
Kennewick	82	25	55.4	0.51	
Kiona	85	22	55.8	0.22	
Kosmos	91	30	53.1	7.80	
Lacenter	80	28	51.1	5.26	
Lakeside	78	29	54.8	0.18	
Lester	82	28	51.2	7.40	T.
Merritt				7.07	
Mottinger Ranch	88	30	58.8	0.28	
Mount Pleasant	79	31	54.8	5.55	
Moxee	86	17	52.4	0.12	
Northport	74	6	45.6	0.68	
Odessa	85	15	49.7	0.19	
Olga	68	30	51.2	4.80	
Olympia	81	20	53.2	6.33	
Pinehill	85	27	54.2	1.14	
Pomeroy	82	25	53.4	1.44	
Port Townsend	68	37	52.6	1.80	
Quinlault	78	31	51.6	24.68	
Rattlesnake	74	22	48.9	0.27	
Republic	80	15	45.8	0.19	
Rex Creek	76	35	54.4	1.81	
Retzville				0.32	
Rock Lake				1.08	
Rosalia	82	22	49.1	1.06	
Ruby Hill	75	24	47.3	0.79	
Sedro	79	31	51.6	8.46	
Sixprong	81	32	56.6	0.10	
Snohomish	86	30	52.7	4.04	
Snoqualmie	81	30	51.9	6.10	
Sunnyside	77	21	53.0	0.07	
Touchet	84	20	55.4	0.24	
Twisp	85	19	49.6	0.36	
Union	83	30	53.6	11.56	
Vancouver	86	38	55.6	3.25	
Vashon	69	37	53.0	5.28	
Wahluke	84	29	56.2	0.70	
Waterville	76	19	48.0	0.12	
Wenatchee (near)	76	29	52.0	0.34	
Wilbur	77	18	47.1	0.48	
Yale	89	32	54.2	12.53	
Zindel	83	32	57.8	0.52	
West Virginia.					
Bancroft	83	26	56.4	3.08	T.

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
West Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bayard	73	12	48.0	3.63	9.0
Beckley				3.58	3.0
Bens Run	82	24	53.8	3.22	1.5
Berkley Springs	80	23	53.5	4.65	T.
Bluefield	76	21	54.5	4.85	
Burlington	78	18	51.4	1.93	T.
Cairo	85	20	57.8	2.86	T.
Central	82	18	54.3	1.86	1.5
Charleston	79	29	57.9	2.54	T.
Creston	79	17	54.6	2.52	
Cuba	81	20	55.0	3.27	0.5
Davis				2.75	
Elkhorn	78	23	54.3	4.53	3.0
Fairmont	80	19	54.5	2.03	T.
Glenville	82	23	56.6	1.86	T.
Grafton	81	21	55.2	2.98	5.0
Green Sulphur Springs	77	19	54.2	2.66	
Harpers Ferry				8.15	
Hinton	77[3]	28[3]	54.6[3]	3.60	0.5
Huntington	80	23	54.6	1.82	T.
Leonard	71	20	51.2	2.90	4.0
Lewisburg	76	17	53.0	2.86	1.8
Logan	85	27	58.4	2.78	2.0
Lost City	76	20	53.0	3.60	T.
Lost Creek	81	19	54.6	1.64	T.
Mannington	84	19	54.8	2.72	2.1
Martinsburg	78	26	53.0	4.30	
Moorefield	82	16	52.4	2.71	T.
Mooresville				2.84	T.
Morgantown	80	23	54.8	3.14	T.
Moundsville	80	22	55.0	3.19	0.5
New Cumberland	80	22	52.1	3.02	T.
New Martinsville	83	23	56.2	2.79	T.
Nuttallburg				3.20	
Oceana	84	24	57.6	3.04	T.
Parsons	79	20	53.2	3.43	4.0
Philippi	80	19	54.5	3.47	1.5
Pickens	73	14	51.6	3.41	9.0
Point Pleasant	85	26	57.6	3.56	
Powellton	86	25	57.6	2.94	T.
Princeton				5.35	9.0
Romney	81	21	53.7	2.41	T.
Rowlesburg				3.20	
Ryan	81	20	54.9	2.59	1.0
Smithfield	85	21	56.5	2.73	1.2
Southside	80	23	55.8	2.83	0.5
Spencer	82	20	53.4	2.59	0.4
Sutton	84	24	56.6	3.25	T.
Terra Alta	78	19	52.9	4.35	3.0
Union	75	15	51.2	3.79	1.0
Uppertract	79	17	52.2	3.90	T.
Wellsburg	75	24	52.0	3.50	4.0
Weston	84	20	55.9	2.34	0.9
Wheeling				2.50	T.
Williamson	81	28	58.1	2.18	T.
Wisconsin.					
Amherst	75	11	46.4	3.08	3.0
Appleton	74	19	48.5	1.90	0.7
Appleton Marsh	78	12	45.5	2.63	1.8
Antigo	75	10	45.6	1.26	2.0
Ashland	76	19	45.8	3.03	2.0
Barron	72	12	44.1	1.66	3.0
Beloit	74	21	49.0	2.36	T.
Brodhead	78	19	51.0	2.58	T.
Burnett	75	15	47.8	2.62	2.0
Butternut	78	10	44.0	4.39	4.8
Chilton	79	18	48.6	2.67	2.0
Chippewa Falls				2.04	0.2
Downing				3.51	T.
Eau Claire	80	19	48.5	2.79	0.5
Florence	76	11	42.6	3.92	1.5
Fond du Lac				2.53	T.
Grand Rapids	79	14	47.4	2.63	2.0
Grand River Locks				5.25	2.0
Grantsburg	77	15	46.6	2.41	T.
Hancock	74	15	47.6	3.06	0.3
Harvey	77	17	49.2	3.12	0.4
Hayward	76	14	44.0	3.51	2.0
Hillsboro	76	13	46.8	2.65	
Koepenick	85	5	47.0	4.20	7.0
Lancaster	78	15	49.4	2.34	0.5
Manitowoc	69	21	48.0	2.93	
Mauston	75	17	48.2	2.50	0.5
Meadow Valley	80	11	46.6	2.30	2.0
Medford	78	15	46.0	3.56	1.0
Menasha				3.23	T.
Merrill	85	9	44.2	2.76	4.0
Minocqua	74	18	44.0	1.58	3.0
Mount Horeb	75	16	49.3	2.70	0.6
Neillsville	78	18	48.5	2.70	2.0
New London	80	16	47.8	3.87	3.0
New Richmond	78	20	48.3	3.09	1.0
Oconto	75	15	47.4	3.90	T.
Osceola	78	16	45.8	3.20	1.0
Oshkosh	75	19	47.8	2.76	T.
Pine River	78	15	48.0	3.93	1.9
Portage	77	18	49.0	4.08	2.0
Port Washington	72	22	48.5	2.18	0.2
Wisconsin—Cont'd.					
Prairie du Chien	82	18	52.0	1.91	T.
Prentice	80	12	45.5	3.74	3.1
Racine	74	23	51.3	2.25	T.
Sheboygan	68	23	49.0	3.18	T.
Shullsburg	75	14	49.4	1.66	T.
Solon Springs	77	9	43.6	3.07	2.0
Spooner	75	14	45.0	2.96	2.0
Stanley	77	16	46.2	2.92	2.5
Stevens Point	80	10	46.6	3.49	2.5
Sturgeon Bay	70	22	47.5	4.35	T.
Valley Junction	76	12	46.1	3.87	3.2
Viroqua	75	21	48.9	3.14	T.
Watertown	75	15	48.2	2.71	0.5
Waukesha				2.36	0.5
Waupaca	81	13	47.6	3.88	4.0
Wausau	76	12	46.6	3.97	3.0
Whitehall	76	18	47.0	1.78	1.0
Wyoming.					
Afton	80	9	44.2	0.44	0.5
Alcova	85	14	47.2	1.09	9.0
Barnum				0.46	1.0
Bedford	75	10	42.4	0.63	
Blue Cap	64	0	32.5	5.04	48.2
Border	78	4	39.4	0.23	2.5
Cambria				0.43	
Chugwater	80	18	45.2	1.68	16.0
Clark	88	11	50.6	0.23	T.
Clear Creek Cabin	71	1	36.8	2.10	21.0
Corbette	85	11	48.5	T.	
Daniel	73	2	37.0	T.	T.
Elk Mountain				3.23	20.0
Embra	80	17	48.8	0.00	
Evanston	77	−3	42.2	1.24	11.0
Fort Laramie	88	12	46.6	1.75	18.7
Fort Washakie	81	8	44.0	1.20	12.0
Granite Canyon	73	12	41.6	2.45	24.0
Granite Springs	86	12	45.6	1.89	20.0
Green River	89		46.2	0.96	12.0
Griggs	83	14	45.6	0.75	1.2
Hatton				3.09	30.0
Hyattville	87	12	49.0		
Jackson	76	7	40.0	0.19	
Kirtley	81	15	43.2	1.67	17.0
Laramie	73	4	40.3	1.33	14.0
Leo	73	2	39.8	1.36	15.0
Little Medicine	78	11	37.0	1.74	22.0
Lolabama Ranch	73	−4	41.0	0.43	1.0
Lusk	80	12	43.5	1.20	12.0
Moorecroft	92	14	49.2	0.20	2.0
Moore	79	17	44.4	3.01	21.8
New Castle	82	20	48.8	0.36	T.
Pathfinder	80	9	45.6	0.81	10.0
Phillips	85	12	42.8	2.61	24.0
Pine Bluff				2.00	20.0
Pinedale	74	3	37.4	T.	T.
Rawlins	73	11	43.0	0.90	14.5
Saratoga	75	6	42.1	0.83	7.1
Sheridan	87	9	46.7	1.35	4.0
Shoshone Canyon	82	18	49.6	0.21	T.
South Pass City	71	2	35.2		
Wells	66	9	34.2	0.16	1.0
Wheatland	86	18	48.3	3.10	
Wolf	87	25	50.2	1.43	10.0
Wyncote	85	14	45.4	2.57	18.5
Yellowstone Pk. (F'tain)	71	2	39.7	0.27	
Yellowstone Pk. (G'd Cn.)	67	−3	37.2	0.99	0.5
Yellowstone Pk. (Lake)	70	0	37.1	0.00	4.0
Yellowstone Pk. (Norris)	69	10	38.4	0.83	
Yellowstone Pk (Riv'side)	71	3	38.2	0.87	
Yellowstone Pk (Snake R)	72	2	38.8	1.70	14.2
Yellowstone Pk. (Soda B.)	73	−14	37.4	1.34	
Yellowstone Pk. (Thumb)	77	4	36.6	1.72	17.2
Yellowstone Pk. (Up. B.)	76	−8	41.9	0.74	8.0
Porto Rico.					
Adjuntas	90	58	72.8	11.93	
Aguirre	98	70	82.6	3.13	
Albonita	87	60	74.0	4.35	
Anasco	92	66	78.8	10.36	
Arecibo	94	62	77.6		
Barros	87	59	73.9		
Bayamon	98	65	78.4	5.74	
Caguas	93	62	77.2	3.87	
Canovanas	93	72	80.4	6.71	
Coamo	92	67	79.6	4.34	
Corozal	93	58	77.0	3.31	
Fajardo	92	70	81.4	8.21	
Guanica	91[e]	63	78.0[e]	6.66	
Hacienda Colosa	92	61	78.4	7.60	
Hacienda Josefa				3.16	
Humacao	89	69	78.2	7.31	
Isolina	89	63	75.2	3.51	
Juana Diaz	95	69	81.4	7.92	
La Carmelita	88	64	75.0	15.91	
Lares	91	60	76.8	9.46	
Las Marias	90	62	76.4	13.44	
Manati	98	64	79.9	3.00	
Maunabo	93	69	81.8	6.44	
Mayaguez	92	65	78.6	9.65	
Porto Rico—Cont'd.					
Ponce	94	70	81.9	7.19	
Rio Blanco	91	66	78.4	5.64	
Rio Piedras				3.72	
San German	92	64	78.8	8.66	
San Lorenzo	96	63	78.4	2.83	
San Salvador	88	61	75.0	6.69	
Santa Isabel	91	69	80.2	3.21	
Vieques	93	66	80.8	2.91	
Yabucoa				5.55	
Yauco	91[e]	62[e]	77.8[e]	9.20	
New Brunswick.					
St. John	61	33	47.2	3.66	
Nicaragua.					
Bluefields	93	70	80.0	15.58	

Late reports for September, 1906.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alaska.					
Fort Gibbon	56	15	35.8	0.59	
Fort Liscum	68	29	46.2	4.11	
Kenai	70	21	47.8	1.41	
Ketchemstock	62	4	37.2	0.51	
Loring	61	31	47.6	17.28	
Nome				1.02	
North Fork	62	7	40.4	0.72	
Skagway	64	26	49.0	1.30	
Summit	72	16	39.3	0.12	
Sunrise	64	27	45.7	1.54	
Wales	62	41	46.8	0.60	
Wood Island	64	38	51.6	1.50	
Arizona.					
Natural Bridge				0.00	
California.					
Cedarville	95	33	61.0	0.56	
Imperial	110	55	83.2	T.	
Colorado.					
Cascade				5.69	7.1
Gladstone				5.41	17.0
Greeley	91[e]	38[d]	60.7[e]		
Lime Creek				7.26	38.0
Manassa				0.70	
Moraine	77	31	52.0	2.16	
Power-house	82	31	54.6	7.50	
Red Mountain				4.97	33.0
Terminal Dam				3.80	T.
Georgia.					
Resaca				0.25	
Idaho.					
Lakeview	85	35	57.6	0.85	
Ola	91	35	62.1	0.94	
Westlake				1.61	
Weston	88	28	58.0	0.76	
Illinois.					
McLeansboro	94	54	72.8	5.43	
Iowa.					
Galva	90	31	64.4	5.98	
Knoxville	96	40	69.5	4.76	
Kentucky.					
Beres	91	46	71.2	3.86	
West Liberty	92[d]	51[d]	72.2[d]	6.21	
Maryland.					
Pocomoke City	92	42	71.0	1.49	
Minnesota.					
Redwood Falls	96	36	65.8	2.82	
Mississippi.					
Shelby	98[m]	60[a]	80.1[e]	10.72	
Missouri.					
Boonville				4.40	
Gallatin				1.86	
Olden	90	50	71.6	6.67	
Montana.					
Deer Lodge				1.78	
Nevada.					
Lovelock	100	29	62.6	T.	
New Mexico.					
Cimarron	83	37	59.4	2.52	
Cliff	93	40	67.9	0.64	
San Marcial	99	40	71.2		
New York.					
Richland	90			3.01	
Setauket	86	47	67.2	1.07	
North Carolina.					
Manteo	92	66	77.4	3.42	
North Dakota.					
Langdon	97	28	60.5	0.94	
Minto	102	31	62.8	0.99	
Ohio.					
Granville	94	44	69.3	2.62	
Summerfield	93	41	68.5	3.08	
Oklahoma.					
Snyder	95	48	74.2		
Watonga	95	50	71.8	3.55	
Oregon.					
Coquille River				2.37	
Richland	93	30	60.6	0.70	

TABLE II.—*Climatological record of cooperative observers*—Continued. *Late reports for September, 1906*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Oregon—Cont'd.	°	°	°	*Ins.*	*Ins.*
Riverside	96	24	59.2	0.29	
Stafford	87	40	61.7	2.71	
Wamic	91	34	63.1	0.23	
Pennsylvania.					
Somerset	86	38	63.1	3.57	
South Carolina.					
Clarks Hill	91	61	76.4	5.04	
Yorkville	92	62	76.6	5.39	
South Dakota.					
Whitehorse	95[b]	38[b]	61.8[b]	1.67	
Tennessee.					
Jackson	96	60	77.6	7.65	
Texas.					
Brownwood	98	52	78.2	.....	
Clarksville	95	51	77.6	2.65	
Graham	97	52	76.6	3.58	
Kerrville	96	50	79.0	2.08	
Sulphur Springs	93	56	78.5	4.25	
Washington.					
Mottinger Ranch	100	41	68.6	0.44	
Pullman	92	33	61.9	0.47	
Wisconsin.					
Whitehall	89	30	64.2	4.23	
Wyoming.					
Lusk	86	30	56.6	1.85	
Willowcreek Cabin	84[1]	.....	52.0[1]	0.97	
Wyncote	92	33	59.7	2.23	
Porto Rico.					
Humacao	89	70	78.7	9.79	
Morovis	93	60	76.8	11.85	

EXPLANATION OF SIGNS.

• Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. + 4.
[2] Mean of 8 a. m. + 8 p. m. + 2.
[3] Mean of 7 a. m. + 7 p. m. + 2.
[4] Mean of 6 a. m. + 6 p. m. + 2.
[5] Mean of 7 a. m. + 2 p. m. + 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

CORRECTION.

Colorado, Manassa, March 1906 Review, make precipitation 0.65 instead of 0.20; April, 0.70 instead of 0.07; May, 0.50 instead of 0.05; July, 0.90 instead of 0.09, and August, 1.90 instead of 0.19.

TABLE III.—*Wind resultants, from observations at 8 a. m. and 8 p. m., daily, during the month of October, 1906.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	13	31	11	21	s. 29 w.	21
Portland, Me	21	23	12	19	s. 74 w.	7
Concord, N. H.†	14	6	10	9	n. 7 e.	8
Burlington, Vt.†	9	17	6	5	s. 7 e.	8
Northfield, Vt	15	41	4	8	s. 9 w.	26
Boston, Mass	23	16	18	18	n.	7
Nantucket, Mass	22	14	31	14	n. 65 e.	19
Block Island, R. I	23	13	30	14	n. 58 e.	19
Providence, R. I	29	9	17	18	n. 3 w.	20
Hartford, Conn	33	19	10	11	n. 4 w.	14
New Haven, Conn	30	11	24	15	n. 25 e.	21
Middle Atlantic States.						
Albany, N. Y	23	27	12	13	s. 14 w.	4
Binghamton, N. Y.†	6	8	15	9	s. 72 e.	6
New York, N. Y	26	8	26	16	n. 29 e.	21
Harrisburg, Pa	23	8	24	20	n. 15 e.	16
Philadelphia, Pa	32	10	23	14	n. 22 e.	24
Scranton, Pa	24	18	18	19	n. 9 w.	6
Atlantic City, N. J	27	9	25	18	n. 21 e.	19
Cape May, N. J	30	8	22	16	n. 15 e.	23
Baltimore, Md	26	8	18	21	n. 9 w.	18
Washington, D. C	32	11	18	16	n. 5 e.	21
Lynchburg, Va	27	13	21	15	n. 23 e.	15
Mount Weather, Va	26	15	19	22	n. 15 w.	13
Norfolk, Va	26	11	22	14	n. 28 e.	17
Richmond, Va	34	13	11	12	n. 3 w.	21
Wytheville, Va	10	11	24	26	s. 63 w.	2
South Atlantic States.						
Asheville, N. C	24	20	19	16	n. 37 e.	5
Charlotte, N. C	33	11	24	12	n. 29 e.	25
Hatteras, N. C	27	11	22	18	n. 14 e.	16
Raleigh, N. C	43	4	7	21	n. 20 w.	41
Wilmington, N. C	33	11	14	19	n. 13 w.	23
Charleston, S. C	37	12	15	15	n.	25
Columbia, S. C	32	7	19	15	n. 9 e.	25
Augusta, Ga	31	8	15	24	n. 21 w.	25
Savannah, Ga	37	8	17	15	n. 4 e.	29
Jacksonville, Fla	36	7	21	15	n. 12 e.	30
Florida Peninsula.						
Jupiter, Fla	23	15	20	19	n. 7 e.	8
Key West, Fla	18	14	31	12	n. 78 e.	19
Tampa, Fla	38	7	18	19	n. 2 w.	31
Eastern Gulf States.						
Atlanta, Ga	26	9	21	25	n. 13 w.	18
Macon, Ga.†	18	2	10	12	n. 7 w.	16
Thomasville, Ga	36	8	16	17	n. 2 w.	28
Pensacola, Fla.†	20	1	10	6	n. 12 e.	19
Anniston, Ala	22	21	25	6	n. 87 e.	19
Birmingham, Ala	24	9	22	18	n. 15 e.	16
Mobile, Ala	38	8	13	19	n. 11 w.	31
Montgomery, Ala	24	11	25	12	n. 45 e.	18
Meridian, Miss	27	12	22	19	n. 11 e.	15
Vicksburg, Miss	26	15	18	13	n. 24 e.	12
New Orleans, La	37	5	25	11	n. 24 e.	35
Western Gulf States.						
Shreveport, La	27	15	17	15	n. 9 e.	12
Bentonville, Ark.†	9	12	11	5	s. 63 e.	7
Fort Smith, Ark	13	13	28	15	e.	13
Little Rock, Ark	26	16	15	21	n. 31 w.	12
Corpus Christi, Tex	29	11	26	6	n. 48 e.	27
Fort Worth, Tex	20	20	21	17	e.	4
Galveston, Tex	32	11	23	10	n. 31 e.	25
Palestine, Tex	25	17	22	9	n. 58 e.	15
San Antonio, Tex	28	16	22	9	n. 47 e.	18
Taylor, Tex.†	13	5	6	11	n. 32 w.	9
Ohio Valley and Tennessee.						
Chattanooga, Tenn	23	21	17	19	n. 45 w.	3
Knoxville, Tenn	21	18	16	24	n. 69 w.	8
Memphis, Tenn	22	20	21	13	n. 76 e.	8
Nashville, Tenn	23	12	15	15	n.	11
Lexington, Ky.†	5	11	11	11	s.	6
Louisville, Ky	24	19	15	17	n. 22 w.	5
Evansville, Ind.†	12	9	10	8	n. 34 e.	4
Indianapolis, Ind	19	16	24	18	n. 63 e.	7
Cincinnati, Ohio	15	15	24	21	e.	3
Columbus, Ohio	17	16	23	19	n. 76 e.	4
Pittsburg, Pa	24	13	20	20	n.	11
Parkersburg, W. Va	24	18	17	17	n.	6
Elkins, W. Va	13	20	20	20	s.	7
Lower Lake Region.						
Buffalo, N. Y	14	21	20	16	s. 30 e.	8
Canton, N. Y.†	8	13	8	10	s. 22 w.	5
Oswego, N. Y	16	33	16	10	s. 19 e.	18
Rochester, N. Y	11	29	15	22	s. 21 w.	19
Syracuse, N. Y	12	29	13	18	s. 16 w.	18
Erie, Pa	14	24	22	12	s. 45 e.	14
Cleveland, Ohio	15	26	26	13	s. 50 e.	17
Sandusky, Ohio†	4	12	11	10	s. 7 e.	8
Toledo, Ohio	16	19	17	21	s. 53 w.	5
Detroit, Mich	19	19	17	17		
Upper Lake Region.						
Alpena, Mich	19	20	11	28	s. 87 w.	17
Escanaba, Mich	21	23	10	23	s. 81 w.	13
Grand Haven, Mich	18	19	27	12	s. 86 e.	15
Grand Rapids, Mich	18	20	24	13	s. 80 e.	11
Houghton, Mich.†	8	7	15	9	n. 80 e.	6
Marquette, Mich	11	26	11	24	s. 41 w.	20
Port Huron, Mich	14	24	20	18	s. 11 e.	10
Sault Ste. Marie, Mich	20	16	27	16	n. 70 e.	12
Chicago, Ill	17	21	18	24	s. 56 w.	7
Milwaukee, Wis	18	20	13	23	s. 79 w.	10
Green Bay, Wis	14	27	12	23	s. 40 w.	17
Duluth, Minn	20	17	13	27	n. 78 w.	14
North Dakota.						
Moorhead, Minn	23	26	12	14	s. 34 w.	4
Bismarck, N. Dak	26	9	17	27	n. 30 w.	20
Devils Lake, N. Dak	18	22	16	21	s. 51 w.	6
Williston, N. Dak	21	16	13	26	n. 69 w.	14
Upper Mississippi Valley.						
Minneapolis, Minn.*	9	11	11	8	s. 56 e.	4
Madison, Wis	16	29	15	19	s. 17 w.	14
Charles City, Iowa	17	26	21	15	s. 34 e.	11
St. Paul, Minn	20	25	17	15	s. 22 e.	5
La Crosse, Wis.†	10	16	3	6	s. 27 w.	7
Davenport, Iowa	19	17	21	20	n. 27 e.	2
Des Moines, Iowa	15	24	19	17	s. 13 e.	9
Dubuque, Iowa	18	24	18	17	s. 9 e.	6
Keokuk, Iowa	20	20	21	18	e.	3
Cairo, Ill	24	23	14	18	n. 76 w.	4
La Salle, Ill.†	12	7	10	13	n. 31 w.	6
Peoria, Ill	22	19	18	16	n. 34 e.	4
Springfield, Ill	23	22	17	18	n. 45 w.	1
Hannibal, Mo.†	11	10	8	11	n. 72 w.	3
St. Louis, Mo	17	20	22	18	s. 53 e.	5
Missouri Valley.						
Columbia, Mo.*	8	9	13	7	n. 80 e.	6
Kansas City, Mo	17	22	22	22	s.	5
Springfield, Mo	17	24	22	15	s. 45 e.	10
Iola, Kans.†	8	11	8	10	s. 34 w.	4
Topeka, Kans.*	8	11	10	9	s. 18 e.	3
Lincoln, Nebr	19	27	18	16	s. 14 e.	8
Omaha, Nebr	17	25	9	24	s. 62 w.	17
Valentine, Nebr	25	16	5	26	n. 67 w.	23
Sioux City, Iowa †	10	13	8	8	s.	3
Pierre, S. Dak	23	18	17	24	n. 54 w.	9
Huron, S. Dak	22	21	13	18	n. 79 w.	5
Yankton, S. Dak. †	7	9	6	14	s. 76 w.	8
Northern Slope.						
Havre, Mont	12	15	14	34	s. 81 w.	20
Miles City, Mont	15	22	16	24	s. 49 w.	11
Helena, Mont	3	30	2	39	s. 54 w.	46
Kalispell, Mont	3	23	8	39	s. 57 w.	37
Rapid City, S. Dak	22	9	7	41	n. 69 w.	36
Cheyenne, Wyo	35	9	5	28	n. 42 w.	35
Lander, Wyo	16	22	11	28	s. 71 w.	18
Yellowstone Park, Wyo	16	20	2	34	s. 83 w.	32
North Platte, Nebr	20	15	15	20	n. 45 w.	7
Middle Slope.						
Denver, Colo	20	20	13	12	s. 7 e.	8
Pueblo, Colo	23	12	18	23	n. 24 w.	12
Concordia, Kans	14	29	16	16	s.	15
Dodge, Kans	21	17	18	16	n. 27 e.	4
Wichita, Kans	22	22	17	16	e.	1
Oklahoma, Okla	22	26	9	12	s. 37 w.	5
Southern Slope.						
Abilene, Tex	22	25	12	15	s. 45 w.	4
Amarillo, Tex	19	23	13	17	s. 45 w.	6
Del Rio, Tex †	10	7	11	11	n.	3
Roswell, N. Mex.	19	23	16	12	s. 45 e.	6
Southern Plateau.						
El Paso, Tex	18	10	23	26	n. 21 w.	8
Santa Fe, N. Mex	26	14	24	16	n. 34 e.	14
Flagstaff, Ariz	23	12	22	21	n. 5 e.	11
Phoenix, Ariz	10	10	26	27	w.	1
Yuma, Ariz	27	10	22	19	n. 10 e.	17
Independence, Cal	35	15	12	12	n.	20
Middle Plateau.						
Reno, Nev	15	14	15	33	n. 87 w.	18
Tonopah, Nev	13	17	12	38	s. 81 w.	26
Winnemucca, Nev	31	9	17	23	n. 15 w.	23
Modena, Utah	7	12	23	7	s. 73 e.	17
Salt Lake City, Utah	21	16	24	18	n. 50 e.	8
Durango, Colo	25	17	7	28	n. 69 w.	22
Grand Junction, Colo	21	11	18	27	n. 42 w.	14
Northern Plateau.						
Baker City, Oreg	16	29	7	21	s. 47 w.	19
Boise, Idaho	26	15	17	23	n. 29 w.	12
Lewiston, Idaho†	2	11	19	5	s. 57 e.	17
Pocatello, Idaho	7	35	16	21	s. 10 w.	28
Spokane, Wash	11	29	14	21	s. 21 w.	19
Walla Walla, Wash	4	40	16	16	s.	36
North Pacific Coast Region.						
North Head, Wash	17	24	20	18	s. 16 e.	7
Port Crescent, Wash.*	7	12	12	8	s. 39 e.	6
Seattle, Wash	14	30	22	10	s. 37 e.	20
Tacoma, Wash	18	27	2	31	s. 73 w.	30
Tatoosh Island, Wash	1	26	23	19	s. 9 e.	25
Portland, Oreg	17	26	13	24	s. 51 w.	14
Roseburg, Oreg	19	19	16	23	w.	7
Middle Pacific Coast Region.						
Eureka, Cal	22	19	12	18	n. 63 w.	7
Mount Tamalpais, Cal	38	7	5	31	n. 40 w.	40
Red Bluff, Cal	32	13	6	27	n. 48 w.	28
Sacramento, Cal	22	25	18	14	s. 53 e.	50
San Francisco, Cal	17	7	4	42	n. 75 w.	39
San Jose, Cal.†	20	1	0	17	n. 42 w.	26
Southeast Farallon, Cal.*	19	1	1	22	n. 49 w.	28
South Pacific Coast Region.						
Fresno, Cal	22	13	10	28	n. 63 w.	20
Los Angeles, Cal	19	9	19	28	n. 42 w.	14
San Diego, Cal	30	8	17	23	n. 15 w.	23
San Luis Obispo, Cal	41	6	12	15	n. 5 w.	35
West Indies						
San Juan, Porto Rico	1	28	41	2	s. 55 e.	47
Grand Turk, W.I.†	3	11	19	3	s. 63 e.	18

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour, during October, 1906, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Abilene, Tex.	14	5:15 a. m.	9:45 a. m.	0.96	6:23 a. m.	6:45 a. m.	0.08	0.14	0.38	0.53	0.59	0.65	.....	.....	.....	.....	.....	.....	.....	.....	.....
Albany, N. Y.	20	.....	.....	1.30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.36	.....	.....	.....
Alpena, Mich.	24-25	.....	.....	0.88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.32	.....	.....	.....
Amarillo, Tex.	5	.....	.....	0.76	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Anniston, Ala.	17-18	.....	.....	1.92	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.32	.....	.....	.....
Asheville, N. C.	18-19	.....	.....	1.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.35	.....	.....	.....
Atlanta, Ga.	2-3	2:53 p. m.	D. N.	1.90	8:06 p. m.	8:36 p. m.	0.22	0.08	0.16	0.28	0.35	0.41	0.50	.....	.....	.....	.....	.....	.....	.....	.....
Atlantic City, N. J.	21-22	D. N.	D. N.	2.83	5:54 a. m.	7:03 a. m.	0.38	0.13	0.18	0.22	0.29	0.38	0.45	0.48	0.51	0.54	0.62	0.77	.....	.....	.....
Augusta, Ga.	18	.....	.....	0.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.40	.....	.....	.....
Baltimore, Md.	20	12:20 a. m.	10:25 a. m.	1.38	4:50 a. m.	5:30 a. m.	0.27	0.09	0.16	0.28	0.45	0.54	0.57	0.66	0.74	.....	.....	.....	.....	.....	.....
Bentonville, Ark.	14-15	.....	.....	0.68	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.27	.....	.....	.....
Binghamton, N. Y.	19-20	.....	.....	1.54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.39	.....	.....	.....
Birmingham, Ala.	1	4:10 a. m.	10:50 a. m.	1.55	6:43 a. m.	7:58 a. m.	0.20	0.10	0.19	0.27	0.32	0.37	0.37	0.40	0.53	0.66	0.70	0.80	1.02	.....	.....
Bismarck, N. Dak.	17	.....	.....	0.12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.07	.....	.....	.....
Block Island, R. I.	9-10	8:27 p. m.	D. N.	1.74	9:31 p. m.	10:21 p. m.	0.38	0.05	0.16	0.18	0.33	0.43	0.56	0.77	0.87	0.97	1.08	.....	.....	.....	.....
Boise, Idaho.	3	.....	.....	0.06	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.06	.....	.....	.....
Boston, Mass.	9	8:18 p. m.	D. N.	1.96	9:02 p. m.	10:02 p. m.	0.05	0.11	0.24	0.40	0.56	0.67	0.86	0.95	1.10	1.26	1.45	1.58	.....	.....	.....
Buffalo, N. Y.	9	.....	.....	1.70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Cairo, Ill.	2-3	.....	.....	0.32	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.07	.....	.....	.....
Canton, N. Y.	6	.....	.....	1.83	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.56	.....	.....	.....
Charles City, Iowa.	23	.....	.....	0.72	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.25	.....	.....	.....
Charleston, S. C.	18	2:45 p. m.	5:15 p. m.	1.00	3:35 p. m.	4:00 p. m.	0.07	0.08	0.31	0.49	0.57	0.64	.....	.....	.....	.....	.....	.....	.....	.....	.....
Charlotte, N. C.	18-19	.....	.....	3.04	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.55	.....	.....	.....
Chattanooga, Tenn.	17-18	.....	.....	2.11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.48	.....	.....	.....
Cheyenne, Wyo.	20-23	.....	.....	2.05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Chicago, Ill.	18	.....	.....	0.77	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.28	.....	.....	.....
Cincinnati, Ohio.	9	.....	.....	0.28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.15	.....	.....	.....
Cleveland, Ohio.	9-10	.....	.....	2.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.29	.....	.....	.....
Columbia, Mo.	23	.....	.....	0.33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.16	.....	.....	.....
Columbia, S. C.	18-19	.....	.....	2.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.26	.....	.....	.....
Columbus, Ohio.	9	.....	.....	0.40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.21	.....	.....	.....
Concord, N. H.	9-10	4:40 p. m.	1:05 a. m.	1.20	7:08 p. m.	7:33 p. m.	0.17	0.11	0.33	0.41	0.61	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Corpus Christi, Tex.	4-5	4:22 a. m.	1:50 a. m.	2.00	6:13 p. m.	7:09 p. m.	0.82	0.09	0.16	0.23	0.31	0.43	0.60	0.68	0.78	0.86	0.94	1.04	.....	.....	.....
Davenport, Iowa.	23-24	.....	.....	0.71	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.19	.....	.....	.....
Del Rio, Tex.	13	5:50 p. m.	6:55 p. m.	0.71	5:53 p. m.	6:12 p. m.	0.01	0.30	0.45	0.53	0.58	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Denver, Colo.	19-23	.....	.....	1.73	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Des Moines, Iowa.	23	.....	.....	0.88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.26	.....	.....	.....
Detroit, Mich.	18-19	.....	.....	1.11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.17	.....	.....	.....
Dodge, Kans.	20-22	.....	.....	0.94	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.10	.....	.....	.....
Dubuque, Iowa.	23-24	.....	.....	0.61	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.28	.....	.....	.....
Duluth, Minn.	24	.....	.....	0.87	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.08	.....	.....	.....
Eastport, Me.	10-11	.....	.....	1.47	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.41	.....	.....	.....
Elkins, W. Va.	19-20	.....	.....	1.74	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.31	.....	.....	.....
Erie, Pa.	24	.....	.....	0.88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.56	.....	.....	.....
Escanaba, Mich.	24	.....	.....	0.97	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.28	.....	.....	.....
Evansville, Ind.	17-19	.....	.....	0.86	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.27	.....	.....	.....
Fort Smith, Ark.	14-15	.....	.....	0.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.25	.....	.....	.....
Fort Worth, Tex.	14	.....	.....	0.67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.14	.....	.....	.....
Galveston, Tex.	13-15	.....	.....	8.23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Grand Haven, Mich.	26-28	.....	.....	1.37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Grand Rapids, Mich.	26-27	.....	.....	1.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.19	.....	.....	.....
Green Bay, Wis.	24	.....	.....	1.28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.48	.....	.....	.....
Hannibal, Mo.	23	.....	.....	0.57	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.22	.....	.....	.....
Harrisburg, Pa.	4	.....	.....	1.85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.54	.....	.....	.....
Hartford, Conn.	20	6:45 a. m.	D. N.	2.79	8:25 a. m.	9:37 a. m.	0.63	0.08	0.15	0.21	0.25	0.29	0.35	0.39	0.44	0.52	0.62	0.83	0.97	.....	.....
Hatteras, N. C.	1-2	9:10 p. m.	8:10 a. m.	2.64	5:45 a. m.	6:58 a. m.	1.36	0.07	0.16	0.36	0.52	0.65	0.73	0.78	0.85	0.91	0.94	1.04	1.24	.....	.....
Huron, S. Dak.	20	.....	.....	2.34	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.22	.....	.....	.....
Indianapolis, Ind.	4	.....	.....	0.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.11	.....	.....	.....
Iola, Kans.	14-16	.....	.....	0.61	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.15	.....	.....	.....
Jacksonville, Fla.	9	.....	.....	0.68	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.41	.....	.....	.....
Jupiter, Fla.	18	3:30 a. m.	7:25 p. m.	5.08	10:17 a. m.	†11:02 a. m.	1.23	0.13	0.29	0.39	0.54	0.68	0.74	0.83	0.88	0.97	.....	.....	.....	.....	.....
Kansas City, Mo.	15-16	.....	.....	0.09	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.06	.....	.....	.....
Key West, Fla.	17-18	2:00 p. m.	8:30 a. m.	2.78	1:36 a. m.	2:11 a. m.	1.54	0.07	0.10	0.20	0.29	0.35	0.46	0.55	.....	.....	.....	.....	.....	.....	.....
Knoxville, Tenn.	5-6	.....	.....	1.12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.34	.....	.....	.....
La Crosse, Wis.	23-24	.....	.....	0.79	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.24	.....	.....	.....
La Salle, Ill.	23-24	.....	.....	0.48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.14	.....	.....	.....
Lexington, Ky.	5-6	.....	.....	0.36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.11	.....	.....	.....
Lincoln, Nebr.	21-24	.....	.....	2.05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.23	.....	.....	.....
Little Rock, Ark.	15-16	.....	.....	2.29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.70	.....	.....	.....
Los Angeles, Cal.	‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Louisville, Ky.	24	.....	.....	0.24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.17	.....	.....	.....
Lynchburg, Va.	3-4	.....	.....	3.27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.69	.....	.....	.....
Macon, Ga.	1	2:40 p. m.	10:30 p. m.	2.37	4:43 p. m.	5:25 p. m.	0.68	0.07	0.18	0.35	0.41	0.53	0.57	0.61	0.68	0.77	.....	.....	.....	.....	.....
Madison, Wis.	26-27	.....	.....	0.77	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.28	.....	.....	.....
Marquette, Mich.	9-11	.....	.....	1.34	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Memphis, Tenn.	2-3	.....	.....	1.10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.24	.....	.....	.....
Meridian, Miss.	4-5	7:03 p. m.	12:20 p. m.	1.97	8:31 a. m.	9:01 a. m.	0.69	0.10	0.27	0.42	0.58	0.63	0.74	.....	.....	.....	.....	.....	.....	.....	.....
Milwaukee, Wis.	26-27	.....	.....	0.63	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.17	.....	.....	.....
Minneapolis, Minn.	20-21	.....	.....	0.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.17	.....	.....	.....
Montgomery, Ala.	17-18	.....	.....	0.67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.52	.....	.....	.....
Mount Weather, Va.	19-21	4:48 p. m.	D. N.	6.17	5:01 p. m. §	5:51 p. m.	0.01	0.13	0.23	0.32	0.46	0.59	0.63	0.71	0.76	0.91	0.98	.....	.....	.....	.....
					5:51 p. m.	6:41 p. m.	.....	1.09	1.14	1.16	1.24	1.25	1.30	1.49	1.63	1.72	1.74	.....	.....	.....	.....
					6:41 p. m.	7:18 p. m.	.....	1.77	1.78	1.80	1.87	2.00	2.12	2.23	2.26	.....	.....	.....	.....	.....	.....
Nantucket, Mass.	6	4:00 p. m.	8:55 p. m.	0.56	8:12 p. m.	8:26 p. m.	0.15	0.08	0.23	0.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nashville, Tenn.	17-18	.....	.....	0.63	.....	.....	.....	.....	.....	.....	.....	.....	0.17	.....	.....	.....	.....	.....	.....	.....	.....
New Haven, Conn.	20	5:00 a. m.	3:05 p. m.	3.78	7:50 a. m.	8:40 a. m.	0.60	0.11	0.17	0.27	0.29	0.34	0.39	0.47	0.54	0.59	0.63	.....	.....	.....	.....
					8:40 a. m.	9:30 a. m.	.....	0.70	0.72	0.75	0.77	0.89	1.03	1.09	1.17	1.27	1.41	.....	.....	.....	.....
					9:30 a. m.	10:10 a. m.	.....	1.51	1.56	1.63	1.69	1.80	1.90	1.96	2.06	.....	.....	.....	.....	.....	.....
New Orleans, La.	4-5	.....	.....	0.94	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.26	.....	.....	.....
New York, N. Y.	19-21	.....	.....	1.99	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.43	.....	.....	.....
Norfolk, Va.	3	D. N.	8:45 p. m.	2.21	12:23 p. m.	12:54 p. m.	0.51	0.16	0.33	0.37	0.55	0.71	0.82	.....	.....	.....	.....	.....	.....	.....	.....
Northfield, Vt.	20	.....	.....	1.16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.36	.....	.....	.....
North Head, Wash.	15	.....	.....	1.39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.34	.....	.....	.....
Oklahoma, Okla.	14-15	.....	.....	1.34	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.24	.....	.....	.....
Omaha, Nebr.	23	.....	.....	0.84	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.21	.....	.....	.....
Palestine, Tex.	13-14	1:45 p. m.	7:10 a. m.	2.42	12:58 a. m.	1:33 a. m.	0.74	0.10	0.23	0.31	0.35	0.47	0.67	0.75	.....	.....	.....	.....	.....	.....	.....
Parkersburg, W. Va.	18-19	.....	.....	0.62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.32	.....	.....	.....	.....
Pensacola, Fla.	1	12:12 a. m.	12:25 p. m.	2.92	7:00 a. m.	7:50 a. m.	0.29	0.06	0.12	0.24	0.42	0.50	0.68	0.88	0.96	1.09	1.25	.....	.....	.....	.....
					7:50 a. m.	8:34 a. m.	.....	1.40	1.50	1.63	1.75	1.81	1.84	1.91	2.12	2.20	.....	.....	.....	.....	.....
Peoria, Ill.	23-24	.....	.....	0.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.30	.....	.....	.....

TABLE IV.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Philadelphia, Pa	4–5	9:00 p. m.	D. N.	2.47	1:04 a. m.	1:41 a. m.	0.94	0.38	0.48	0.83	1.20	1.37	1.44	1.48	1.52						
Pittsburg, Pa	18–19			1.66														*			
Portland, Me	9–10			1.46									0.32								
Portland, Oreg	15			1.37														0.24			
Pueblo, Colo	20–22			0.68														*			
Raleigh, N. C	19–20			0.99														0.26			
Richmond, Va	16–23			4.98														0.39			
Rochester, N. Y	6–7			1.41														0.47			
Sacramento, Cal	31			T.														T.			
St. Louis, Mo	23–24			0.58														*			
St. Paul, Minn	23–24			1.28														0.30			
Salt Lake City, Utah	31			0.31														*			
San Antonio, Tex	13–14			0.50														0.32			
San Diego, Cal	27–28			0.03														0.02			
Sandusky, Ohio	24			0.52														0.30			
San Francisco, Cal	11			0.01														0.01			
Savannah, Ga	2	6:26 p. m.	8:50 p. m.	0.39	6:34 p. m.	6:45 p. m.	0.03	0.13	0.29	0.33											
Scranton, Pa	4–5			1.38														0.33			
Seattle, Wash	15–16			1.30														0.28			
Shreveport, La	13–15			1.66														0.49			
Spokane, Wash	14			0.23														0.20			
Springfield, Ill	23–24			0.71														0.21			
Springfield, Mo	5			0.43														0.15			
Syracuse, N. Y	19–20			1.01														0.41			
Tampa, Fla	2			0.29														0.25			
Taylor, Tex	13–14	9:30 p. m.	7:30 a. m.	0.59	2:40 a. m.	2:50 a. m.	0.03	0.23	0.44												
Thomasville, Ga	1	3:45 p. m.	5:05 p. m.	0.89	4:04 p. m.	4:29 p. m.	0.06	0.19	0.40	0.59	0.67	0.73									
Do	6	5:10 a. m.	6:38 a. m.	1.21	5:19 a. m.	5:42 a. m.	T.	0.37	0.44	0.45	0.53	0.59									
Toledo, Ohio	24			0.52														0.49			
Topeka, Kans	15–16			0.31														0.10			
Valentine, Nebr	19–20			1.34														0.31			
Vicksburg, Miss	4–6			3.15														0.69			
Washington, D. C	18–20	11:40 a. m.	2:25 a. m.	3.93	8:26 p. m. §	8:48 p. m. §	1.87	0.12	0.31	0.46	0.62	0.68									
Wichita, Kans	21	3:40 p. m.	5:35 p. m.	0.69	3:56 p. m.	4:26 p. m.	0.01	0.08	0.19	0.28	0.36	0.50	0.58								
Wilmington, N. C	1–2			3.40														0.51			
Wytheville, Va	16–20			2.97														0.44			
Yankton, S. Dak	21–22			1.30														0.23			
San Juan, Porto Rico	29	9:30 p. m.	9:45 p. m.	0.34	9:34 p. m.	9:42 p. m.	0.01	0.21	0.33												

*Self-register not working † Self-register out of order from 11:02 a. m. to 2:10 p. m. ‡ No precipitation. § Of 19th.

TABLE V.—*Data furnished by the Canadian Meteorological Service, October, 1906.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Pressure, in inches. Sea level, reduced to mean of 24 hours.	Pressure, in inches. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Total snowfall.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F	30.00	30.14	+.23	47.1	+ 1.7	54.0	40.3	5.37	+0.02	
Sydney, C. B. I	30.13	30.17	+.21	48.0	+ 1.5	58.1	37.8	4.11	−0.58	
Halifax, N. S	30.04	30.15	+.15	49.6	+ 2.6	59.6	39.5	3.99	−1.56	
Grand Manan, N. B	30.05	30.10	+.10	49.8	+ 2.9	56.2	43.3	3.84	−0.87	
Yarmouth, N. S	30.05	30.12	+.10	49.5	+ 1.9	58.3	40.8	3.15	−1.55	
Charlottetown, P. E. I	30.07	30.11	+.15	49.0	+ 2.5	57.1	41.0	4.41	−0.49	
Chatham, N. B	30.03	30.05	+.09	48.7	+ 5.7	59.9	37.5	3.31	−0.55	
Father Point, Que	29.98	30.00	+.05	42.7	+ 2.9	49.9	35.4	3.26	+0.36	T
Quebec, Que	29.71	30.03	+.03	46.0	+ 3.6	53.6	38.4	2.77	−0.38	T.
Montreal, Que	29.83	30.04	+.03	47.9	+ 3.1	55.0	40.9	3.85	+0.72	0.5
Rockliffe, Ont	29.41	30.02	+.01	45.0	+ 2.2	55.2	34.8	3.09	+0.66	
Ottawa, Ont	29.68	30.00	−.01	46.8	+ 3.0	55.1	38.5	3.36	+0.81	
Kingston, Ont	29.74	30.05	+.02	49.1	+ 2.1	57.1	41.1	5.48	+2.75	2.3
Toronto, Ont	29.65	30.03	−.01	49.1	+ 2.5	56.9	41.3	4.58	+2.22	2.8
White River, Ont	28.71	30.04	+.06	38.3	+ 1.2	47.7	28.9	2.99	+0.64	3.5
Port Stanley, Ont	29.38	30.02	−.03	49.9	+ 2.1	58.3	41.6	4.66	+1.68	0.5
Saugeen, Ont	29.32	30.03	+.01	48.7	+ 2.6	57.5	40.0	4.87	+1.70	10.2
Parry Sound, Ont	29.32	30.02	+.01	47.2	+ 3.3	57.0	37.5	5.96	+2.04	1.0
Port Arthur, Ont	29.30	30.01	+.03	40.4	+ 0.5	49.2	31.7	2.18	−0.38	1.8
Winnipeg, Man	29.12	29.96	−.02	41.7	+ 2.6	52.7	30.8	0.21	−1.49	1.4
Minnedosa, Man	28.11	29.94	−.03	42.2	+ 4.4	53.2	31.2	1.14	−0.06	2.9
Qu'Appelle, Sask	27.66	29.92	−.05	43.9	+ 4.5	54.2	33.6	0.59	−0.51	1.9
Medicine Hat, Alberta	27.63	29.92	−.05	49.4	+ 4.6	61.1	37.8	0.44	−0.14	
Swift Current, Sask	27.37	29.95	−.02	45.0	+ 2.9	56.3	33.6	0.18	−0.70	
Calgary, Alberta	26.39	29.93	−.02	44.4	+ 4.3	56.2	32.6	0.90	+0.42	1.6
Banff, Alberta	25.38	30.00	+.05	40.7	+ 1.4	49.4	32.1	1.95	+0.93	10.6
Edmonton, Alberta										
Prince Albert, Sask	28.29	29.86	−.11	41.0	+ 3.9	50.6	31.4	0.81	−0.02	
Battleford, Sask	28.11	29.85	−.12	43.7	+ 4.1	55.7	31.8	0.16	−0.29	T.
Kamloops, B. C	28.74	29.96	.00	50.4	+ 3.4	59.1	41.8	1.28	+0.67	
Barkerville, B. C	25.63	29.95	+.01	38.3	− 1.4	44.8	31.9	6.32	+3.62	5.0
Victoria, B. C	30.01	30.11	+.10	52.0	+ 2.8	57.4	46.7	5.60	+2.23	
Hamilton, Bermuda	29.86	30.02	.00	75.5	+ 2.5	80.1	71.0	11.84	+7.46	
Dawson, Yukon										

TABLE VI.—*Heights of rivers referred to zeros of gages, October, 1906.*

Stations.	Distance to mouth of river.	Flood stage on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Milk River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Havre, Mont	237	9	2.3	1–16	2.2	17–31	2.3	0.1
Yellowstone River.								
Billings, Mont	330	8	1.0	1–4	0.7	22–31	0.8	0.3
Cheyenne River.								
Rousseau, S. Dak	7	9	1.6	23	0.8	7	1.1	0.8
James River.								
Lamoure, N. Dak	330	14	0.2	1–6	−0.7	28–31	−0.3	0.9
Huron, S. Dak	139	9	0.8	1, 3, 22, 28–31	0.4	13, 17	0.7	0.4
Republican River.								
Clay Center, Kans	42	18	6.2	27	4.9	7	5.5	1.3
Smoky Hill-Kansas River.								
Abilene, Kans	277	22	1.6	26, 31	0.1	11, 14, 21	0.5	1.5
Manhattan, Kans	116	18	3.5	28, 29	1.8	1	2.7	1.7
Topeka, Kans	87	21	6.4	1	5.6	24–27	5.9	0.8
Missouri River.								
Townsend, Mont	2,504	11	3.8	11, 12, 19–31	3.6	16, 17	3.7	0.2
Fort Benton, Mont	2,285	12	0.3	1–31	0.3	1–31	0.3	0.0
Wolfpoint, Mont	1,952	17	−0.9	1, 2	−1.3	8–13, 17–31	−1.2	0.4
Bismarck, N. Dak	1,309	14	0.6	8–12, 19–22	0.0	4	0.4	0.6
Pierre, S. Dak	1,114	14	1.6	26–28	0.7	12, 13	1.2	0.9
Sioux City, Iowa	784	19	8.1	27	5.7	21	6.7	2.4
Blair, Nebr	705	15	7.2	27	5.7	17, 18, 20–23	6.2	1.5

TABLE VI.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Flood stage on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Missouri River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Omaha, Nebr.	669	18	7.8	1	5.7	20	6.7	2.1
St. Joseph, Mo	481	10	3.9	1	0.8	20	2.1	3.1
Kansas City, Mo.	388	21	10.3	1,2	6.5	22	8.2	3.8
Glasgow, Mo.	231	18	8.3	1	4.4	25	5.8	3.9
Boonville, Mo.	199	20	12.1	1	8.9	22–26	9.9	3.2
Hermann, Mo.	103	24	11.4	2,3	6.4	25–28	7.8	5.0
Minnesota River.								
Mankato, Minn	127	18	6.5	1,31	3.6	20–23	4.9	2.9
St. Croix River.								
Stillwater, Minn.	23	11	8.7	1,2	4.6	22	6.6	4.1
Red Cedar River.								
Cedar Rapids, Iowa	77	14	4.0	1,2	3.2	15,19,21-23	3.5	0.8
Des Moines River.								
Des Moines, Iowa	205	19	4.5	31	2.7	23	3.2	1.8
Illinois River.								
La Salle, Ill	197	16	13.2	2	11.7	14–18	12.1	1.5
Peoria, Ill.	135	14	8.9	6	8.0	24–26,29	8.4	0.9
Clarion River.								
Clarion, Pa.	32	10	2.8	8	0.4	1	1.8	2.4
Conemaugh River.								
Johnstown, Pa.	64	7	2.2	7,8	0.8	1	1.5	1.4
Allegheny River								
Warren, Pa	177	14	3.1	31	0.5	3–6	2.1	2.6
Franklin, Pa	114	15	5.0	30,31	1.0	6	3.3	4.0
Parker, Pa.	73	20	4.7	31	0.8	1	2.9	3.9
Freeport, Pa.	29	20	7.4	31	1.3	1	4.8	6.1
Springdale, Pa	17	27	10.9	31	6.2	1	9.0	4.7
Cheat River.								
Rowlesburg, W. Va.	36	14	5.8	20	1.8	18,19	2.8	4.0
Youghiogheny River.								
Confluence, Pa	59	10	1.1	20,21	—0.1	18,19	0.3	1.2
West Newton, Pa.	15	23	1.0	8,22	0.0	1–3	0.4	1.0
Monongahela River.								
Weston, W. Va.	161	18	2.4	7	— 0.9	27,28,31	0.0	3.3
Fairmont, W. Va.	119	25	17.3	21	14.0	27	1.5	3.3
Greensboro, Pa	81	18	10.8	21	7.1	18,19	7.9	3.7
Lock No. 4, Pa.	40	28	12.3	22	7.5	29	8.7	4.8
Beaver River.								
Ellwood Junction, Pa.	10	14	4.2	10	2.1	6	3.0	2.1
Muskingum River.								
Zanesville, Ohio	70	25	9.9	22	8.5	17,18	9.0	1.4
Beverly, Ohio.	20	25	7.3	10	5.3	1	6.5	2.0
Little Kanawha River.								
Glenville, W. Va	77	20	3.6	7	1.0	21,25	2.1	2.6
Creston, W. Va.	38	20	5.0	8	3.4	18,19,29-31	3.8	1.6
New-Great Kanawha River.								
Radford, Va	213	14	18.5	19	0.8	17,18	3.4	17.7
Hinton, W. Va.	153	14	12.2	20	2.4	17,18	4.2	9.8
Charleston, W. Va.	58	30	19.8	21	4.6	18	7.1	15.2
Scioto River.								
Columbus, Ohio	110	17	2.5	26,27,30,31	1.0	1–3	1.9	1.5
Licking River.								
Falmouth, Ky.	30	25	6.0	2,3	1.5	29–31	2.7	4.5
Miami River.								
Dayton, Ohio	77	18	1.4	5	0.6	23	0.9	0.8
Kentucky River.								
Jackson, Ky.	287	24	6.0	6	4.6	2,3	5.4	1.4
Beattyville, Ky	254	30	3.2	7	0.2	30,31	1.0	3.0
High Bridge, Ky.	117	17	11.6	2,9,10	9.2	31	10.1	2.4
Frankfort, Ky.	65	31	7.9	3	5.9	28–31	6.6	2.0
Wabash River.								
Mount Carmel, Ill.	75	15	2.7	6,7	1.2	30,31	1.9	1.5
Cumberland River.								
Burnside, Ky.	518	50	15.2	8	0.8	31	3.3	14.4
Celina, Tenn.	383	45	18.4	9	2.3	31	6.8	16.1
Carthage, Tenn.	308	40	19.0	7	2.5	31	7.6	16.5
Nashville, Tenn.	193	40	26.2	7	8.6	31	14.0	17.6
Clarksville, Tenn.	126	42	27.5	9	4.6	31	13.6	22.9
Powell River.								
Tazewell, Tenn.	44	20	2.3	7	0.2	30,31	0.8	2.1
Clinch River.								
Speers Ferry, Va.	156	20	3.3	21	0.0	3	1.0	3.3
Clinton, Tenn	52	25	10.0	8,9	4.4	31	6.3	5.6
South Fork Holston River.								
Bluff City, Tenn.	35	15	6.0	20	0.8	16,18	1.7	5.2
Holston River.								
Rogersville, Tenn.	103	14	6.7	20	2.0	17,18	3.0	4.7
French Broad River.								
Asheville, N. C.	144	6	5.3	4	0.8	30,31	2.2	4.5
Leadvale, Tenn.	70	12	6.5	4	0.5	18	2.9	6.0
Little Tennessee River.								
McGhee, Tenn	17	20	13.3	1	3.9	30,31	5.8	9.4
Hiwassee River.								
Charleston, Tenn	18	22	16.5	1	1.9	29	5.0	14.6
Tennessee River.								
Knoxville, Tenn.	635	12	8.5	21	2.3	31	4.7	6.2
Loudon, Tenn	590	25	10.0	1	2.6	31	5.0	7.4
Kingston, Tenn.	556	25	10.2	1	2.6	31	5.1	7.6
Chattanooga, Tenn.	452	33	19.3	3	4.7	31	9.5	14.6
Bridgeport, Ala	402	24	17.3	3	3.2	31	7.8	14.1
Guntersville, Ala.	349	31	26.2	4	6.2	31	13.1	20.0
Florence, Ala.	255	16	15.8	4–6	3.4	31	8.1	12.4
Riverton, Ala.	225	26	26.6	7	6.0	31	13.5	20.6
Johnsonville, Tenn.	95	21	25.3	9	6.3	31	13.6	19.0
Ohio River.								
Pittsburg, Pa.	966	22	8.3	22	4.7	26	6.3	3.6
Davis Island Dam, Pa.	960	25	7.6	22	3.2	2	5.6	4.4
Beaver Dam, Pa	925	27	9.8	22	4.9	1	7.5	4.9
Wheeling, W. Va.	875	36	9.0	23	2.9	1	6.7	6.1
Parkersburg, W. Va.	785	36	9.3	24	3.2	1	7.2	6.1
Point Pleasant, W. Va.	703	39	15.7	22	5.0	1,2	8.4	10.7
Huntington, W. Va	660	50	19.5	22	8.2	2	11.8	11.3
Ohio River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Catlettsburg, Ky.	651	50	19.2	22	7.0	2	11.1	12.3
Portsmouth, Ohio	612	50	18.9	23	8.4	3	11.8	10.5
Maysville, Ky.	559	50	18.2	23	8.4	3,4	11.5	9.8
Cincinnati, Ohio.	499	50	19.6	24	10.2	1	13.3	9.4
Madison, Ind	413	46	15.6	25	9.2	7	11.5	6.4
Louisville, Ky	367	28	7.3	25,26	4.6	23	5.6	2.7
Evansville, Ind	184	35	15.4	4	7.9	25	10.8	7.5
Mount Vernon, Ind	148	35	14.3	4	7.3	25	10.0	7.0
Paducah, Ky.	47	40	21.1	9	8.7	27	13.9	12.4
Cairo, Ill.	1	45	26.7	9	13.8	28	19.9	12.9
St. Francis River.								
Marked Tree, Ark.	104	17	11.3	11	6.6	1	10.2	4.7
Neosho River.								
Neosho Rapids, Kans.	326	22	1.0	26,28	0.7	12,13,20-22	0.8	0.3
Iola, Kans.	262	10	0.1	1–4	— 1.3	26,27	—0.3	1.4
Oswego, Kans.	184	20	0.5	1	0.0	28–31	0.2	0.5
Fort Gibson, Ind. T.	3	22	11.4	1	9.5	31	10.0	1.9
Canadian River.								
Calvin, Ind. T	99	10	3.4	19	1.8	12	2.4	1.6
Black River.								
Blackrock, Ark.	67	12	14.7	4	3.8	31	9.7	10.9
White River.								
Calicorock, Ark	272	15	10.2	1	0.9	31	2.8	9.3
Batesville, Ark.	217	18	16.8	1	3.0	31	5.6	13.8
Newport, Ark.	185	26	21.0	2,3	4.0	30,31	11.4	17.0
Clarendon, Ark.	75	30	24.5	23,24	17.5	1	23.1	7.0
Arkansas River.								
Pueblo, Colo.	1334	10	3.7	10	.....	.....	.....	.....
Wichita, Kans.	832	10	0.7	1,25–28	— 0.2	14	0.2	0.9
Tulsa, Ind. T.	551	16	4.4	1	3.3	17-19,27,28	3.6	1.1
Webbers Falls, Ind. T.	465	23	6.2	1	3.3	18–31	4.0	2.9
Fort Smith, Ark.	403	22	6.3	1	3.1	18,19,31	4.0	3.2
Dardanelle, Ark.	256	21	6.0	1	2.6	31	3.6	3.4
Little Rock, Ark.	176	23	8.4	1	4.0	31	5.3	4.4
Pine Bluff, Ark.	121	23	11.2	1	6.1	31	7.6	5.1
Yazoo River.								
Greenwood, Miss	175	38	22.2	14–16	14.5	1	19.3	7.7
Yazoo City, Miss.	80	25	15.0	6,12–18	9.5	1	13.7	5.5
Ouachita River.								
Camden, Ark.	304	39	7.9	19	4.9	15,16,31	5.8	3.0
Monroe, La	122	40	6.4	8	3.3	18	4.6	3.1
Red River								
Denison, Tex.	768	22	6.6	18	1.9	13	3.0	4.7
Arthur City, Tex.	688	27	13.8	19	7.3	14	9.1	6.5
Fulton, Ark.	515	28	15.4	21	9.4	15	11.4	6.0
Shreveport, La.	327	29	8.0	1	2.4	17,20	4.6	5.6
Alexandria, La.	118	33	12.8	1	5.0	23–25	7.6	7.8
Mississippi River.								
Fort Ripley, Minn.	2,082	10	6.7	2	5.4	15,18–20	6.0	1.3
St. Paul, Minn.	1,954	14	8.0	1	5.0	22,23	6.3	3.0
Red Wing, Minn.	1,914	14	5.9	31	3.2	24	4.5	2.7
Reeds Landing, Minn.	1,884	12	5.5	1,2,31	3.4	21–24	4.4	2.1
La Crosse, Wis.	1,819	12	6.3	2–5	4.3	22–24	5.3	2.0
Prairie du Chien, Wis.	1,759	18	6.7	1–8	5.0	23–26	5.9	1.7
Dubuque, Iowa	1,699	18	6.6	5,6,8,9	4.8	26	5.8	1.8
Clinton, Iowa	1,629	16	6.0	5–10	4.6	24,26–29	5.4	1.4
Leclaire, Iowa	1,609	10	4.1	1–7,10	2.7	29,30	3.5	1.4
Davenport, Iowa	1,593	15	5.5	1	4.1	26,28,29	4.8	1.4
Muscatine, Iowa	1,562	16	6.4	1	4.7	27,28	5.6	1.7
Galland, Iowa	1,472	8	3.1	1,2	1.9	31	2.3	1.2
Keokuk, Iowa.	1,463	15	5.4	1	3.3	31	4.3	2.1
Warsaw, Ill.	1,458	18	8.3	1	5.8	31	7.2	2.5
Hannibal, Mo	1,402	13	6.5	1	4.1	28–31	5.1	2.4
Grafton, Ill	1,306	23	8.4	1,2	5.8	31	6.9	2.6
St. Louis, Mo	1,264	30	13.0	3,4	5.7	30	8.5	7.3
Chester, Ill	1,189	30	11.2	4	4.9	31	7.5	6.3
New Madrid, Mo.	1,003	34	21.7	9	11.3	28	16.3	10.4
Luxora, Ark	905	33	12.4	12	5.0	31	8.8	7.4
Memphis, Tenn	843	33	18.7	11	8.0	30	13.3	10.7
Helena, Ark.	767	42	25.2	12	11.8	31	18.8	13.4
Arkansas City, Ark.	635	42	28.0	13	16.5	31	22.8	11.5
Greenville, Miss.	595	42	23.3	14,15	13.5	31	18.7	9.8
Vicksburg, Miss.	474	45	26.0	16	14.2	1	20.9	11.8
Natchez, Miss.	373	46	27.3	17	16.5	1	22.8	10.8
Baton Rouge, La. (a)	240	35	18.8	17–19	9.7	3	14.9	9.1
Donaldsonville, La	188	28	13.6	16	7.0	3	10.7	6.6
New Orleans, La.	108	16	8.9	15	5.3	3	7.3	3.6
Atchafalaya River.								
Simmesport, La.	127	33	21.4	18	13.8	2	17.9	7.6
Melville, La.	108	31	24.3	19	16.9	4	21.2	7.4
Morgan City, La	19	8	5.1	15	2.0	10,11	3.8	3.1
Grand River.								
Grand Rapids, Mich.	38	11	2.1	30,31	1.2	16–18,21	1.6	0.9
Sandusky River.								
Tiffin, Ohio	65	8	0.9	9,10	0.5	3,4,15–18	0.7	0.4
Connecticut River.								
Hartford, Conn.	50	16	4.3	22	0.9	15	2.5	3.4
Mohawk River.								
Utica, N. Y. (b)	98	6	7.2	21	0.3	19	1.7	6.9
Tribeshill, N. Y.	42	12	0.8	28	— 0.4	6	0.3	1.2
Schenectady, N. Y.	19	15	1.7	21	0.5	17,18	1.0	1.2
Hudson River.								
Glens Falls, N. Y.	197	20	4.4	22	3.1	8	3.5	1.3
Troy, N. Y.	154	14	3.2	29	1.5	4	2.2	1.7
Albany, N. Y.	147	12	4.3	6,23	0.5	12	2.8	3.8
Pompton River.								
Pompton Plains, N. J.	6	8	4.4	21	3.5	5,16–18	3.8	0.9
Passaic River.								
Chatham, N. J.	69	7	3.0	24,25	2.0	17–20	2.4	1.0
Lehigh River.								
Mauch Chunk, Pa.	45	15	5.6	21	4.2	1,3,4, 18,19	4.7	1.4

TABLE VI.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Flood stage on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Schuylkill River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Reading, Pa	66	12	2.0	5	0.0	1–3	0.7	2.0
Delaware River.								
Hancock (E. Branch), N. Y.	269	12	5.0	21	2.8	18, 19	3.5	2.2
Hancock (W. Branch), N. Y.	269	10	4.9	21	2.9	18	3.4	2.0
Port Jervis, N. Y	204	14	3.4	21	0.0	1, 4, 5	0.9	3.4
Phillipsburg, N. J.	142	26	4.8	27	0.6	1, 2, 18, 19	1.9	4.2
Trenton, N. J.	92	18	9.0	20	1.0	1–4, 13–19	1.8	8.0
North Branch Susquehanna.								
Binghamton, N. Y.	183	16	3.7	20–22	1.9	18, 19	2.4	1.8
Towanda, Pa	139	16	4.8	21	0.8	1–8	1.7	4.0
Wilkes-Barre, Pa	60	17	8.6	22	2.7	1, 3, 4	4.1	5.9
West Branch Susquehanna.								
Renovo, Pa.	90	16	3.8	20	0.3	1–4	1.3	3.5
Williamsport, Pa.	39	20	5.8	21	0.9	1, 2	2.0	4.9
Juniata River.								
Huntingdon, Pa.	90	24	4.5	20	2.9	16	3.2	1.6
Susquehanna River.								
Harrisburg, Pa.	69	17	5.1	23	1.0	1–4	2.2	4.1
Shenandoah River.								
Riverton, Va.	58	22	16.0	20	— 0.5	1–18	1.5	16.5
Potomac River.								
Cumberland, Md.	290	8	4.0	20–22	2.3	1, 2	2.7	1.7
Harpers Ferry, W. Va.	172	18	15.8	21	0.0	16	3.7	15.8
James River.								
Buchanan, Va.	305	12	15.6	20	3.0	16–18	5.4	12.6
Lynchburg, Va.	260	18	14.6	20	1.1	17, 18	4.1	13.5
Columbia, Va.	167	18	31.5	20	4.0	16	10.0	27.5
Richmond, Va.	111	12	18.7	22	— 0.4	14	3.6	19.1
Dan River.								
Danville, Va.	55	8	7.4	20	0.0	17	0.8	7.4
Staunton River.								
Randolph, Va.	26	28	25.7	21	4.2	17	9.7	21.5
Roanoke River.								
Clarksville, Va.	196	12	9.9	21	0.4	1	2.7	9.5
Weldon, N. C.	129	30	35.5	23	10.3	1, 2, 16, 17	16.2	25.2
Tar River.								
Tarboro, N. C.	46	25	5.9	23	2.0	14	2.4	3.9
Greenville, N. C.	21	22	7.6	24	3.6	14, 15	5.0	4.0
Haw River.								
Moncure, N. C.	171	25	9.5	21	8.2	14, 16	8.5	1.3
Cape Fear River.								
Fayetteville, N. C.	112	38	11.2	22	3.0	17	5.1	8.2
Waccamaw River.								
Conway, S. C.	40	7	5.8	5–7	3.8	1, 3, 20	4.7	2.0
Pedee River.								
Cheraw, S. C	149	27	25.0	21	3.0	18–19	7.5	22.0
Smiths Mills, S. C.	51	16	13.6	31	7.0	19, 20	10.1	6.6
Lynch Creek.								
Effingham, S. C.	35	12	8.6	1	4.4	18, 19	6.7	4.2
Black River.								
Kingstree, S. C.	45	12	10.1	27	6.0	20	7.9	4.1
Catawba-Wateree River.								
Mount Holly, N. C.	143	15	7.4	5	2.0	16–18, 31	3.2	5.4
Catawba, S. C	107	11	15.3	20	2.5	17, 18	5.0	12.8
Camden, S. C.	54	24	28.6	21	7.8	15	14.0	20.8
Broad River.								
Blairs, S. C	36	14	8.6	5	1.3	18	2.8	7.3
Saluda River.								
Pelzer, S. C.	109	7	8.1	4	3.9	31	4.7	4.2
Chappels, S. C.	56	14	13.3	5	4.0	31	6.7	9.3
Congaree River.								
Columbia, S. C	52	15	8.0	5	1.0	26	2.9	7.0
Santee River.								
Rimini, S. C	108	10	14.9	25	10.6	18	12.8	4.3
St. Stephens, S. C.	50	10	9.7	31	8.8	24–26	9.2	0.9
Edisto River.								
Edisto, S. C.	75	6	4.3	1	2.4	20–22	3.3	1.9
Broad River.								
Carlton, Ga.	30	11	6.0	4	2.6	16–18, 26–31	3.3	3.4
Savannah River.								
Calhoun Falls, S. C.	347	15	9.9	4	3.2	17, 18	4.2	6.7
Augusta, Ga.	268	32	23.6	5	8.7	28	13.0	14.9
Oconee River.								
Milledgeville, Ga.	147	25	15.9	2	2.8	30, 31	5.2	13.1
Dublin, Ga	79	30	10.3	10	0.3	17	3.8	10.0
Ocmulgee River.								
Macon, Ga.	203	18	18.2	4	2.9	30, 31	6.5	15.3
Abbeville, Ga.	96	11	14.2	10	3.1	20	7.0	11.1
Flint River.								
Woodbury, Ga.	227	10	3.8	19	0.5	14–17	1.5	3.3
Montezuma, Ga.	152	20	12.4	6	3.0	30, 31	6.2	9.4
Albany, Ga.	90	20	9.7	9	2.0	16, 17, 20	4.6	7.7
Bainbridge, Ga.	29	22	10.8	10	4.8	18	6.9	6.0
Chattahoochee River.								
Oakdale, Ga	305	18	16.1	4	3.5	27	5.8	12.6
West Point, Ga	239	20	13.4	15	3.6	28–31	5.4	9.8
Eufaula, Ala	90	40	29.0	20	3.6	17	9.6	25.4
Alaga, Ala.	30	25	26.8	21	5.8	31	11.6	21.0
Coosa River.								
Rome, Ga.	266	30	16.6	2	2.3	31	6.6	14.3
Gadsden, Ala.	162	22	18.5	4	3.2	31	8.4	15.3
Lock No. 4, Ala.	113	17	14.4	3, 4	2.7	31	7.3	11.7
Wetumpka, Ala	12	45	30.0	3	6.6	31	15.7	23.4
Tallapoosa River.								
Milstead, Ala.	42	35	16.9	2	2.6	18	6.4	14.3
Alabama River.								
Montgomery, Ala.	323	35	28.1	4	4.3	31	10.1	23.8
Selma, Ala	246	35	34.3	5	5.7	31	17.4	28.6
Black Warrior River.								
Tuscaloosa, Ala.	90	43	47.7	1	6.5	31	19.7	41.2
Tombigbee River.								
Columbus, Miss	316	33	12.5	7	— 1.8	31	3.4	14.3
Vienna, Ala.	246	42	21.6	8	1.2	31	8.9	20.4
Demopolis, Ala.	168	35	44.5	10	2.7	31	23.3	41.8
Pascagoula River.								
Merrill, Miss.	78	20	20.6	3	3.6	31	13.7	17.0
Pearl River.								
Columbia, Miss.	110	14	22.0	10	5.7	31	16.1	16.3
Sabine River.								
Logansport, La.	315	25	11.4	18	2.1	12, 13	6.4	9.3
Neches River.								
Rockland, Tex	105	20	13.1	15	1.5	22–27	3.4	11.6
Beaumont, Tex.	18	10	4.9	20	1.0	31	2.5	3.9
Trinity River.								
Dallas, Tex.	320	25	5.9	18	4.0	15	4.8	1.9
Long Lake, Tex.	211	35	13.6	1	4.2	13, 14	7.1	9.4
Riverside, Tex.	112	40	5.4	3, 4	1.4	13	3.2	4.0
Liberty, Tex	20	25	10.8	15	5.3	13	7.1	5.5
Brazos River.								
Kopperl, Tex.	345	21	1.6	1	0.0	11–22	0.4	1.6
Waco, Tex.	285	24	6.5	21	3.7	18–20	4.3	2.8
Valley Junction, Tex.	215	40	4.6	17, 25	2.0	13–16, 24	3.1	2.6
Hempstead, Tex	140	40	2.7	24	— 0.4	21	0.8	3.1
Booth, Tex	61	39	4.7	28	3.3	23, 24	3.9	1.4
Colorado River.								
Ballinger, Tex.	489	21	2.0	14–16	1.4	26–31	1.7	0.6
Austin, Tex.	214	18	2.3	1	1.1	25–31	1.5	1.2
Columbus, Tex.	98	24	8.5	1	7.5	27–31	7.9	1.0
Guadalupe River.								
Gonzales, Tex.	112	22	0.7	1, 2, 15–20	0.5	10–14, 21–31	0.6	0.2
Victoria, Tex	53	16	1.6	5	0.8	19, 29	1.1	0.8
Rio Grande River.								
San Marcial, N. Mex.	1,233	14	8.4	30	7.3	2	7.9	1.1
El Paso, Tex	1,030	14	7.7	29	6.0	1	7.0	1.7
Red River of the North.								
Moorhead, Minn.	284	26	10.6	29–31	9.3	16, 20–22	9.8	1.3
Kootenai River.								
Bonners Ferry, Idaho.	123	24	3.2	28	0.6	25	1.4	2.6
Pend d'Oreille River.								
Newport, Wash.	86	14	—1.0	1, 3	—1.2	{13–17, 25, 26, 30, 31}	—1.1	0.2
Snake River.								
Lewiston, Idaho	144	24	2.0	27	0.5	1–3	0.9	1.5
Riparia, Wash.	67	30	3.5	27	1.0	1–4	1.7	2.5
Columbia River.								
Wenatchee, Wash	473	40	9.0	1	7.5	24	7.8	1.5
Umatilla, Oreg.	270	25	3.7	28, 29	2.7	11	3.1	1.0
The Dalles, Oreg.	166	40	5.1	30	2.8	15	3.4	2.3
Willamette River.								
Albany, Oreg.	118	20	3.0	18, 19	0.6	3	1.3	2.4
Salem, Oreg.	84	20	3.2	19	—0.4	2, 3, 12	0.7	3.6
Portland, Oreg.	12	15	4.8	18, 19	1.2	9, 10	2.8	3.6
Sacramento River.								
Red Bluff, Cal.	201	23	0.5	12–15	0.3	23–26, 29–31	0.4	0.2
Sacramento, Cal.	64	25	7.6	1	6.8	22	7.1	0.8

(g) No flow 7 days. (l) No current 26 days. (t) Water below gage 20 days.

RAINFALL IN JAMAICA.

Thru the kindness of Dr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following table:

The rainfall for October was therefore much below the average for the whole island. The greatest fall, 20.86 inches, occurred at King's Valley, in the west-central division; while the least, 1.90 inches, fell at Long Pond in the northern division.

Comparative table of rainfall.

[Based upon the average stations only.]

OCTOBER, 1906.

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1906.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	23	8.86	14.45
Northern division	22	51	5.08	7.65
West-central division	26	24	10.55	12.70
Southern division	27	35	9.27	10.84
Means	100		8.44	11.41

Honolulu, T. H., latitude 21° 19′ north, longitude 157° 52′ west; barometer above sea, 38 feet; gravity correction, —0.057 inch, applied. October, 1906.

Day.	Pressure.*		Air temperature.				Moisture.				Wind.				Precipitation.		Clouds.					
							8 a. m.		8 p. m.		8 a. m.		8 p. m.				8 a. m.			8 p. m.		
	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Maximum.	Minimum.	Wet.	Relative humidity.	Wet.	Relative humidity.	Direction.	Velocity.	Direction.	Velocity.	8 a. m.	8 p. m.	Amount.	Kind.	Direction.	Amount.	Kind.	Direction.
1	30.02	29.98	79.0	77.0	84	71	69.0	60	68.0	63	ne.	4	e.	4	0.00	0.00	3 1	Cl. Cu.	0 e.	few.	Cu.	e.
2	29.94	29.96	79.0	75.5	84	74	68.0	57	69.0	72	ne.	6	ne.	3	0.00	0.03	1	Cu.	e.	1	Cu.	e.
3	29.96	29.96	77.0	75.5	84	72	71.0	74	70.5	78	ne.	3	e.	3	0.02	0.01	8	Cu.	e.	few.	Cu.	e.
4	29.96	29.95	79.0	78.5	82	70	71.0	68	72.0	73	e.	3	w.	6	0.00	0.00	1	Cu.	0	4	Cu.	nw.
5	29.95	29.96	78.0	76.5	82	71	72.0	75	72.5	82	sw.	5	sw.	2	0.00	0.00	2 2	Cl.-cu. Cu.	w. e.	1	Cu.	e.
6	30.00	29.98	79.0	76.5	82	73	73.0	75	72.0	80	s.	3	ne.	2	0.02	0.00	2	Cu.	e.	0	0	0
7	29.99	29.94	79.0	75.5	82	73	73.0	75	72.0	84	ne.	2	ne.	9	0.00	T.	1	Cu.	e.	8	S.	e.
8	29.94	29.94	79.5	77.0	82	71	71.5	68	72.5	81	se.	1	ne.	4	0.00	0.02	few	Cu.	e.	4	S.	e.
9	30.01	30.02	78.5	77.0	85	72	73.0	77	73.0	83	nw.	4	ne.	12	0.00	0.00	few.	Cu.	e.	1	Cu.	e.
10	30.06	30.04	79.5	78.0	85	75	73.2	74	74.0	83	ne.	7	ne.	4	0.00	T.	7	Cu.	e.	8	N.	e.
11	30.02	29.98	80.0	79.0	85	75	74.0	75	73.0	75	ne.	6	ne.	8	0.01	0.00	3	Cu.	e.	0	0	0
12	30.01	29.98	81.0	78.0	84	75	73.5	70	72.0	75	ne.	9	e.	5	0.00	0.00	2	Cu.	e.	0	0	0
13	30.02	30.01	80.0	77.5	84	74	72.0	68	70.0	69	ne.	8	ne.	3	0.01	0.00	4	Cu.	e.	0	0	0
14	30.04	30.02	79.5	77.5	84	73	71.0	66	71.0	72	e.	4	ne.	2	0.04	0.00	4	Cu.	e.	3	Cu.	e.
15	30.03	29.99	76.0	76.0	82	73	71.4	80	71.0	78	e.	8	ne.	9	0.08	0.03	8	N.	e.	4	Cu.	e.
16	30.01	29.98	80.0	77.0	82	70	69.0	57	68.0	63	ne.	5	e.	9	0.06	T.	3 2	Ci.-cu. Cu.	nw. e.	0	0	0
17	29.98	29.92	76.5	76.5	82	71	70.0	72	70.0	72	e.	8	se.	3	0.05	0.08	2 2	Cu. N.	e. e.	0	0	0
18	29.92	29.91	80.0	77.0	84	73	71.0	64	71.5	77	ne.	5	e.	6	0.04	0.01	7	Cu.	e.	0	0	0
19	29.96	29.99	77.0	77.0	82	72	71.3	76	72.0	79	ne.	1	se.	3	0.00	0.00	9 1	Cl.-s. Cu.	0 e.	3	Cu.	e.
20	29.99	29.99	78.5	78.0	82	74	71.5	71	70.5	69	ne.	6	ne.	3	0.00	0.00	9 1	Ci.-cu. Cu.	0 e.	0	0	0
21	29.99	30.00	79.3	77.0	84	74	71.8	69	71.0	74	ne.	7	e.	8	0.01	0.02	3	Cu.	e.	2 1	A.-s. Cu.	0 e.
22	30.05	30.02	80.0	78.5	84	77	72.2	69	70.0	66	ne.	14	nw.	10	0.00	0.00	1 2	Ci. Cu.	0 e.	0	0	0
23	30.06	30.05	79.5	78.0	84	75	69.0	58	72.0	75	e.	9	e.	7	0.00	0.00	2	Cu.	e.	4	Cu.	e.
24	30.05	29.99	78.4	78.0	83	72	69.0	62	69.0	63	e.	8	ne.	13	T.	T.	7	Cu.	e.	0	0	0
25	30.00	29.99	79.8	78.0	89	75	67.0	51	69.0	63	e.	10	e.	10	T.	T.	2 2	Ci. Cu.	0 e.	4	Cu.	ne.
26	30.01	30.02	79.0	78.0	83	71	69.0	60	69.5	65	e.	9	ne.	12	0.05	T.	1	Cu.	e.	5	Cu.	e.
27	30.04	30.03	78.0	77.0	82	70	69.0	63	69.0	67	s.	8	e.	9	0.10	0.00	4	Cu.	e.	6	Cu.	e.
28	30.03	30.00	76.5	77.0	82	72	69.0	68	69.5	69	ne.	9	ne.	12	T.	T.	7	Cu.	e.	4	Cu.	e.
29	30.02	30.01	78.0	74.0	81	71	68.0	60	69.5	80	ne.	7	e.	10	0.02	0.04	3	Cu.	e.	8	Cu.	e.
30	30.01	30.00	77.0	76.0	82	69	69.0	67	70.0	74	e.	12	e.	20	0.04	0.02	8	Cu.	e.	7	Cu.	e.
31	30.04	30.05	79.0	77.0	81	71	71.0	68	69.5	69	ne.	12	e.	10	0.01	0.02	1 1	A.-s. Cu.	0 e.	4	Cu.	e.
Mean	30.003	29.989	78.7	77.1	82.9	72.5	70.8	67.6	70.7	73.3	ne.	6.5	ne.	7.1	0.56	0.28	4.2	Cu.	e.	2.6	Cu.	e.

Observations are made at 8 a. m. and 8 p. m., local standard time, which is that of 157° 30′ west, and is 5h and 30m slower than 75th meridian time. *Pressure values are reduced to sea level and standard gravity.